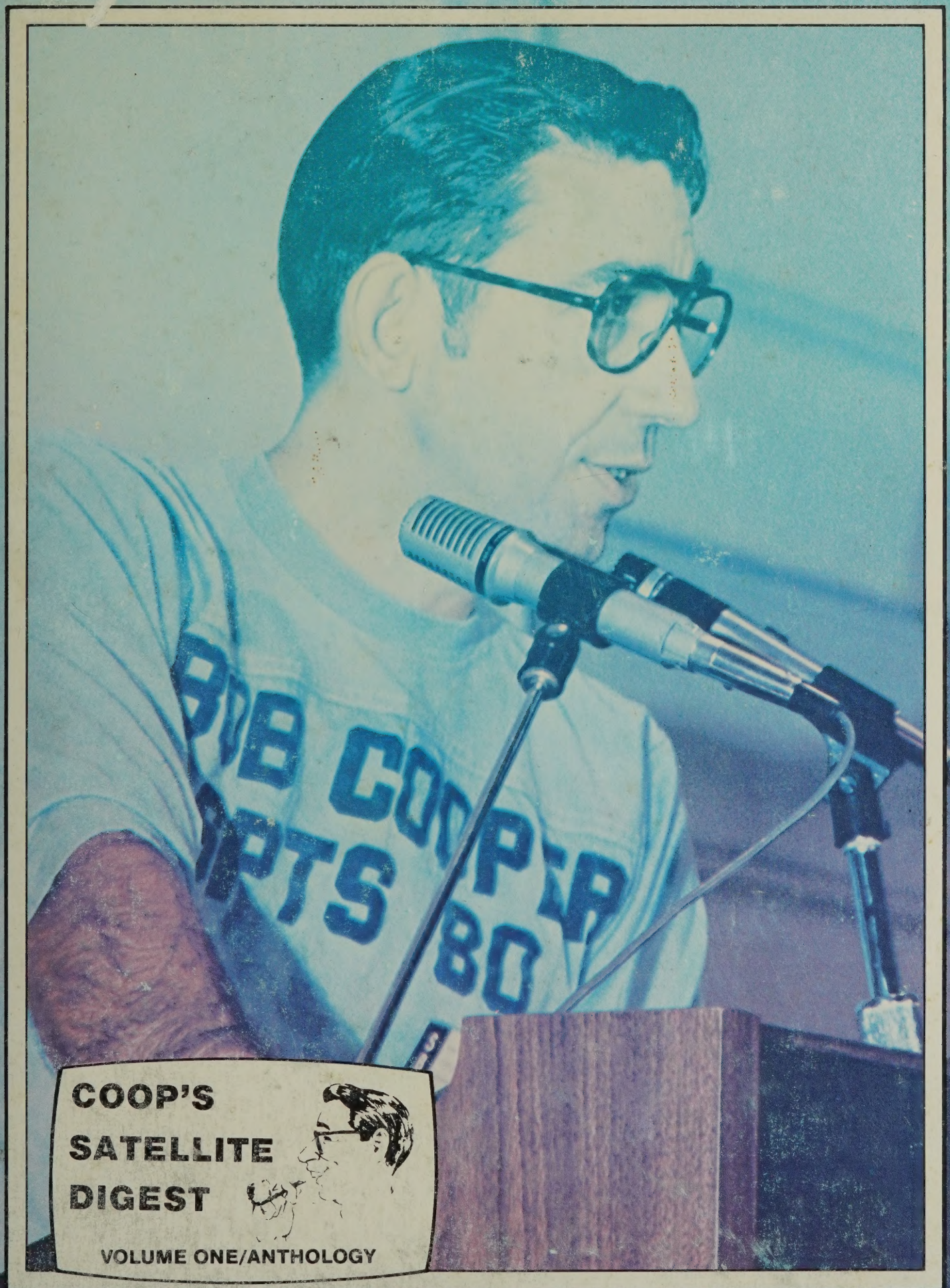


COOP'S SATELLITE DIGEST

VOLUME ONE/ANTHOLOGY

Birth of a legend

National Microtech, Inc. introduces Apollo™ X9 Satellite Antenna.

National Microtech, Inc. continues to sell more home satellite antenna systems than anyone in the world. Microtech's new Apollo™ is so far advanced over our competition-in features, performance, and cost- that we feel Apollo™ is destined to become a legend in the satellite industry. If you are interested in buying or selling Apollo™ systems, give us a call today. Remember, no one sells the Apollo™ but Microtech dealers and distributors. See the legend today.

DEALER PRICES

3 Units	$1395
10 Units	$1195
100 Units	$1095

Optional remote satellite finder $495 wholesale dealer price.

National Microtech, Inc.

1-800-647-6144

In Mississippi 601-226-8432

COOP'S SATELLITE DIGEST

TOP OF TWO YEARS

MY - how time flies when you are having fun! Corny, but appropriate. Two years ago, most people couldn't even spell satellite terminal. Now many have one.

In the early days, we kept saying "there is a business (industry) here, **someplace**, if only we can find it!". Well, we found it. As this issue of the two early years of **CSD** heads to press, the volume in private, home terminals has grown beyond the 2,500 per month range; seasonably adjusted of course for the winter months slow down. Two years ago, we may have been delivering 35 to 50 private terminal systems per month. Two years from now? Your guess is as good, if not better, than ours!

Many complain that the early day "spirit" of the home satellite activity is gone; that nobody is willing to **share** their "secrets" anymore. Browsing through the first two years of **CSD**, that seems like a valid statement. Many who shared technology early, like David Barker (he developed the first, practical, single conversion receiver scheme), later saw their "sharing" come back to them as competitive-to-them "boxes". A person makes that mistake only once, if he is smart.

Anything in life, that has potential, must mature as that potential grows. Part of maturing is to apply good business sense to what one is doing. Good business sense seldom involves giving away hard-earned "secrets".

Is that era of the industry gone, for good? Probably, although some will undoubtedly try to bring it back. **It was fun**, while it was here; anyone who participated cherished those new, monthly issues of **CSD**, and the latest "trick circuits" and detailed circuit analysis articles.

As **CSD Anthology** heads to press, it is clear that off-shore technology is about to invade the until-now largely American technology, in this small area of electronics. How well American and Canadian entrepreneurs do in the next two years will be interesting to review two years hence.

CSD ANTHOLOGY

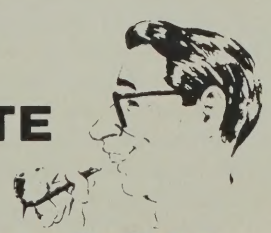
TWO YEARS IN REVIEW ..... Page 2
October 1979 10-79-1
November 1979 11-79-1
December 1979 12-79-1
January 1980 1-80-1
February 1980 2-80-1
March 1980 3-80-1
April 1980 4-80-1
May 1980 5-80-1
June 1980 6-80-1
July 1980 7-80-1
August 1980 8-80-1
September 1980 9-80-1

End of Volume One

October 1980 10-80-1
November 1980 11-80-1
December 1980 12-80-1
January 1981 1-81-1
February 1981 2-81-1
March 1981 3-81-1
April 1981 4-81-1
May 1981 5-81-1
June 1981 6-81-1
July 1981 7-81-1
August 1981 8-81-1
September 1981 9-81-1

End of Volume Two

COOP'S SATELLITE DIGEST ANTHOLOGY



CSD ANTHOLOGY is published by West Indies Video, Ltd.; Grace Bay, Providenciales, Turks and Caicos Islands. CSD ANTHOLOGY is a compilation of the first 24 issues of **CSD** (Coop's Satellite Digest), covering the period October 1979 through September 1981; with foreward. Price for Anthology is $60 for any single year (12 issue bound set), or $100 for all 24 issues (two bound sets), US funds, in US, only. **Rates** for delivery to **non**-US points **available upon request**. **CSD** (Anthology) maintains a US office at P. O. Box 100858, Fort Lauderdale, FL 33310 (305/771-0505). **CSD** is published monthly as the trade journal of the private satellite terminal industry.

Copyright 1982 by West Indies Video, Ltd.

HOW IT BEGAN

The Home satellite industry, abbreviated by early pioneer Scientific Atlanta as "Homesat"®, had its roots in the backwoods of northern Canada, along the eastern coast of England, in the foothills of California's Sierra Nevada range, and on a small farm outside of Oklahoma City. It began because several people refused to believe the then popular story that to receive satellite television you first needed a ten meter or larger dish antenna (roughly 33 feet), then you needed a $5,000 (up) signal amplifier, and finally, that you had to have a $10,000 satellite receiver.

Who did it first is traceable. Probably the first "amateur experiment" with satellite TV was conducted by England's Steve Birkill. Using an American created (ATS-6) satellite, on loan to India for development of a national educational television system, Birkill as early as 1975 was watching satellite TV with home built, primitive equipment. Closer to home, the American US satellite service began in September of 1975 when HBO started transmitting one channel of programming on RCA F2. The first telecast was a professional boxing bout, with Mohammed Ali as the draw. At the time HBO turned on this service, there were two cable companies in the United States ready for receipt of the service. One in Mississippi, the other in Florida. Within one year the number of FCC licensed cable firms receiving the HBO feed would be 75.

There were forces at work, however, which saw something smaller than 33 foot dishes as practical. During 1976 Bob Cooper was editor in chief for a cable television technical magazine; **CATJ**. During the first few months of 1976 he started work on "pushing" cable industry suppliers to try smaller antennas. A few did, and the results were delightful. At a Cooper created cable show in midsummer of 1976, antennas as small as 4.5 meters (15 feet) displayed pictures which cable owners proclaimed "crystal clear". With industry evidence building that ten meter dishes were not required for this service, Cooper attacked the FCC rules that mandated ten meter dishes. Late in 1976, the FCC, acting on a petition drafted by Coop, and responding to his testimony before a Congressional Committee, retracted its ten meter antenna rule. The FCC decided that cable systems could use terminals "as small as 4.5 meters", providing the terminals attained certain minimum levels of performance. The FCC did not rule out even smaller terminals, at that time; merely noting they found it difficult to believe that terminals smaller than 4.5 meters would attain the performance criteria they set forth.

The end of 1976 and the start of 1977 were exciting times. A fellow in Atlanta, Georgia decided he was going to take his local, independent television station (call letters: WTCG) and make it a national station. He went to RCA to lease a transponder. Then the FCC told Turner he would not be able to rent a transponder for this service, directly, so Turner found a middle man named Ed Taylor. Taylor formed something called southern Satellite Systems, and with the support of Turner they got WTCG "on the bird" late in December of 1976.

With the FCC announcement that smaller antennas were OK, the cable industry exploded. There were around 105 operating terminals on January 1, 1977. By March of 1977 the FCC was receiving upwards of **200 applications per month** from new cable firms desirous of having terminals. That explosive growth in cable use of satellites prompted other programming firms to jump on the bandwagon.

Meanwhile several heads were turning. If 4.5 meter terminals were working OK, for cable service, and the FCC mandated that cable operators build into their terminals a "3 dB threshold margin", how small could you make the antenna and still get a good quality "living room" picture? We found out during 1977. Coop rounded up a 6 footer, a 10 footer, a 12 footer and a 20 footer and proceeded, on a private basis, to gather the parts and install the antennas; at his Oklahoma farm. Meanwhile others, unknown to one another, were having similar thoughts. Out in San Andreas, California, a Stanford University Professor named H. Taylor Howard was digging a 15 foot screen mesh reflector out of a Navy surplus yard. Far to the north, in the Yukon, a fellow named Rod Wheeler was building himself a 20 foot reflector.

Cooper, with his high visibility in the cable industry, went through the motion of obtaining FCC approval for "satellite experimental receiving terminals". To back that up, he collected more than a dozen letters from programmers on the satellite, authorizing his receipt of their programs. Taylor Howard, unaware that you were supposed to have permission to do such things, went ahead with his experiments. In July of 1977 he saw his first picture; appropriately, a slide being transmitted by HBO that said "**Attention All Earth Stations**". Howard recalls it may have been one of the most exciting moments of his life, after months of cutting and piecing together an old, battered antenna, and matching up surplus telephone company electronic equipment, he saw his first picture. "When I saw that slide, then I knew I was hooked for life" Taylor relates.

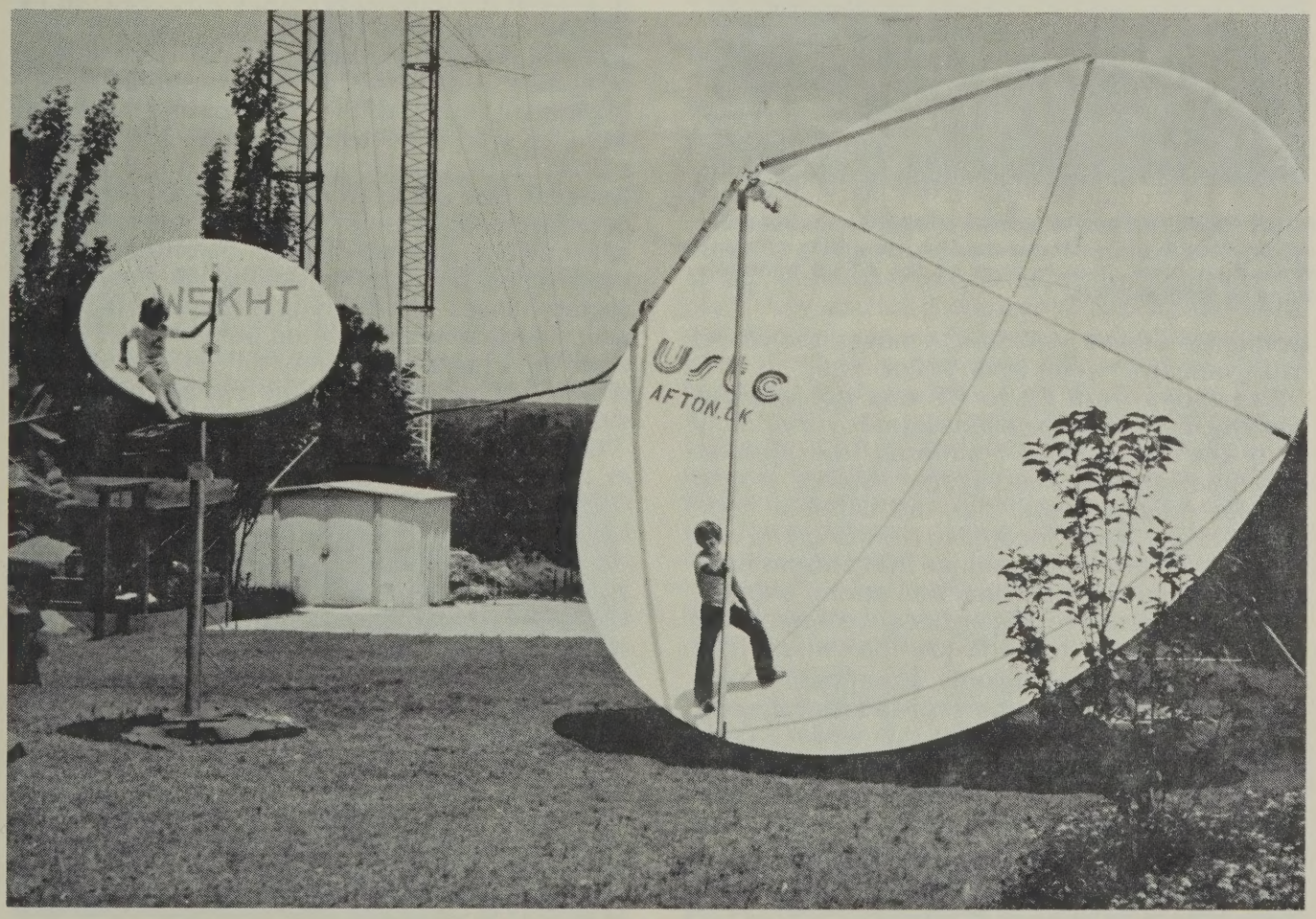
Rod Wheeler, in Canada, **knew** what the Canadian law was. **He chose to ignore it.** Wheeler was employed by a Canadian cable firm, operating a cable service in a Yukon town. Wheeler's cable customers were forced to watch week old videotapes, flown north from southern Canada, or, a poorly programmed CBC "Northern service"

channel delivered in those days by ANIK-2. Wheeler had kept current on American technology, and he knew what US firms were doing with satellites. He also knew that Canadian regulations prohibited licensed Canadian cable systems from installing satellite receiving terminals, or, tapping into the US domestic satellite system.

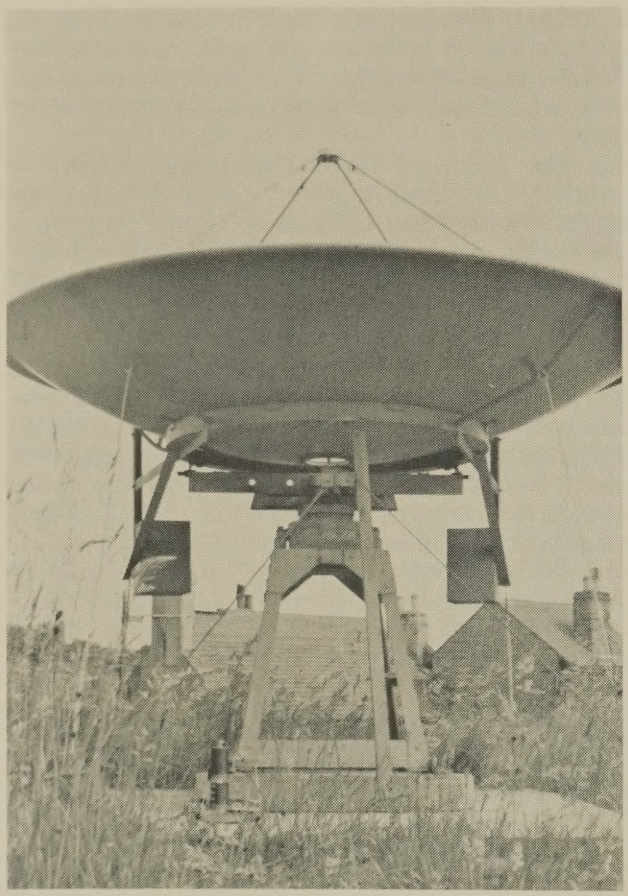
Wheeler finished his home built 20 foot dish, invested $3,500 in a low noise amplifier and another $7,500 in a Microdyne 24 channel receiver. On July 3rd of 1977 Rod Wheeler connected WTCG to his cable system, via satellite. This was the start of a three day Canadian holiday, and Wheeler was counting on those three days so that Canadian authorities could not "swoop down" on his installation until his viewers had been treated to 72 hours of "live, US television".

Well, they did swoop down on Wheeler. And they forced him to shut the system off. More than 8,000 signatures, on petitions to the government, to allow the WTCG reception to continue fell on deaf, Canadian bureaucratic ears. In disgust, but not defeat, Wheeler attached the base of his 20 foot terminal to a tundra sled and hauled it five miles through the bush to his log cabin home. He, alone, would continue to enjoy US satellite television.

By the start of 1978 the cable growth of operating terminals was explosive. So was the programming growth. All early cable programs were being transmitted on RCA F2, at 119 degrees west. RCA first filled up their horizontal transponders (2 through 24, the even numbered ones), and then they began putting new comers on the vertical side. It soon became apparent F2 did not have enough channel capacity to accommodate all of the firms who wanted to be transmitting satellite programs to cable systems. F2 was "in the hole" two transponders, to start with, because of defects. Added to that were 6 which had a special "Alaskan antenna/boresight pattern", making those six virtually useless east of the Mississippi. RCA had to find some place to move the mushrooming and exploding cable industry; and F1 at 135 degrees west was se-



THE COOPER ANTENNA FARM - circa 1977. A six foot terminal (left) **and a 20 foot terminal** (right) **were joined by ten and twelve foot surfaces to locate the "break over point" for dish size. The 20 footer is still installed at Arcadia.**



FIRST PRIVATE TERMINAL? Steve Birkill's surplus (as in used) **8 foot Andrew microwave dish, parked in a "safe" stowed position, went to work on the ATS-6 transmissions as early as 1975.**

lected. On June 1, 1978, RCA moved the whole cable industry "west" from 119 to 135.

The move from F2 to F1 was not without penalty. F2 had an excellent signal over virtually all of the 48 states. F1 suffered from weaker coverage into the southeastern states. It also was far enough west, that, the satellite "look angle" for terminals located in New England was very low. So low that antennas that **should** have worked, because the signal was strong enough, suffered degraded reception because they picked up "earth noise" from the low look angle. The cable industry, begrudgingly, accepted F1. The problems were minor, **when spread nationwide**, and, there was RCA's promise that **when** F3 was launched (then said to be late in 1979), things would get better for the northeast and southeast.

By early in 1979 the cat was out of the bag. Coop had written an article, and **TV GUIDE** had published it, telling the whole world how much fun it was to have 20+ channels of satellite TV in your living room. Coop's mail box filled up quickly. More than 10,000 letters in two weeks. **Everyone** wanted to know where to buy equipment for a

Elimination of the 30 foot requirement opened up a tremendous new market for cable and MATV systems.

private terminal. The answer was easy, but painful. "**Nobody is selling private terminals**". Not then, anyhow. Yes, there were perhaps a couple of dozen high rollers who had invested $40,000 to $100,000 for their own private, "CATV Grade", systems. But such people were obviously not walking around every street corner.

The response told Coop something. That people **would pay** a **reasonable price** for a home terminal. If they could get good pictures. Coop sat down and wrote a book, titled "**Home Satellite TV Reception Handbook**" Since it was written to answer the questions people who read the **TV GUIDE** article, or saw Coop on the CBS Cronkite Evening News (October 31, 1978), were asking, he answered all letters with a data sheet explaining the availability of the $7.50 booklet. Then he went to work on Taylor Howard and a chap named Robert Coleman, who lived in Travelers Rest, SC. Bob Coleman was, like Taylor Howard, a backyard experimenter. Coleman, unlike Professor Howard, had no degree or credentials in electronics; only results. And while Howard directed himself at designing a low-cost receiver, which a reasonably talented person could duplicate, (and have work every time) Coleman was directed at bringing down the overall costs of the system.

By late in the spring of 1979 the pieces were in place. Howard had his receiver perfected. Coleman had built numerous terminals, and had begun building his own low noise amplifiers. Working with both, Coop created a pair of "do it yourself" manuals; one explaining the work of each man, their results, and what it took to get the same results.

Then Coop fashioned a mailing, to go out to everyone of the several thousand people who had ordered his "Home Satellite TV Reception Handbook". The mailing announced the new manuals, and, the first "Satellite Private Terminal

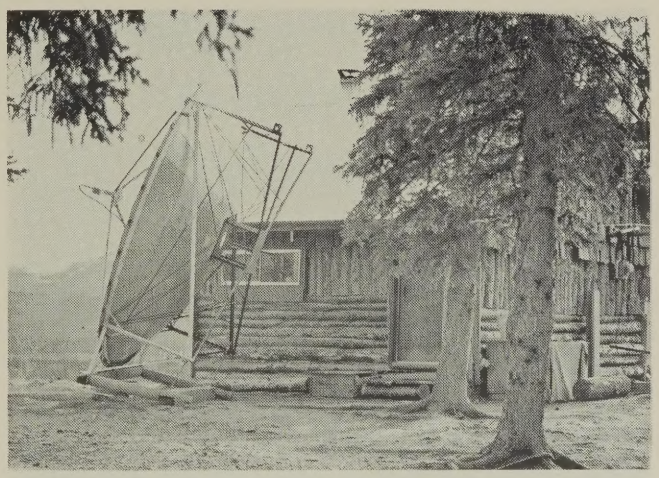
Coop's TV GUIDE article opened the floodgates of public inquiry.

Seminar". On June 1, 1979 Coop sold his interest in **CATJ** magazine, and began devoting fulltime to the home satellite TV effort.

Bob and Susan Cooper had arranged to hold the first SPTS at South Oklahoma City Junior College. Seating for up to 350 people was available, in a modern, new audio-visual center building. Another pioneer, H. Paul Shuch of San Jose City College (California) was brought into the group to conduct a series of 12 hour-long lectures. Shuch had taken the Howard receiver onward another step, and his tutorial approach to teaching people how to design low cost satellite systems would later prove to be one of the strong, basic building blocks of a new industry being born.

By the start of the third week ahead of the first SPTS, the Coopers had a problem. Too many people. A series of articles, describing (ultimately) a complete home terminal, had begun just the month before in **RADIO ELECTRONICS** magazine. Coop's article series was bringing in hundreds of queries about attending the first SPTS. Going back to the college, to try to get more seating room out of a fixed sized structure, didn't work out. At the last minute, additional seating was placed in smaller, adjoining rooms, and closed circuit television spread the seminar sessions to 500-plus people seated all over the facility.

Just hours before the first SPTS was to begin, a Federal District Court Judge issued a subpeona to Coop to appear. A microwave company, operating the Oklahoma City MDS system, had asked the court to grant them an injunction to prevent the first SPTS! They claimed that Coop and his people were going to teach "technical, trade secrets" and show people "how to steal private, microwave television programs". After a three hour hearing, where Coop had to appear without counsel because of the short notice, the court ruled in favor of SPTS. And the first satellite seminar became history.

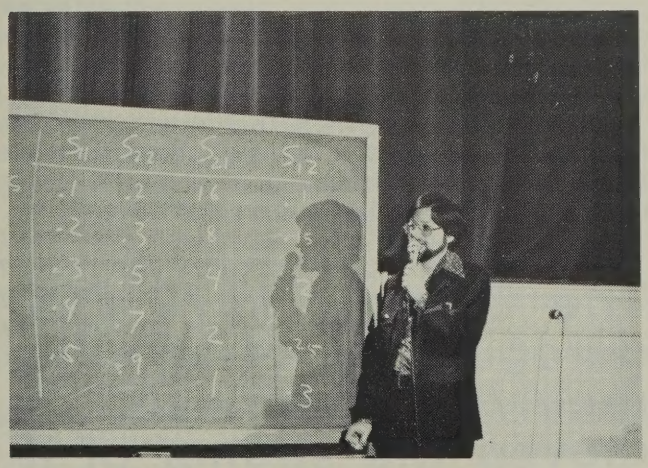


WHEELER TERMINAL in the Canadian Yukon was dragged across five miles of tundra with a jeep to the long cabin home. Canada's first!

Well, not quite. There were more than 500 people at the first gathering. And **eight** equipment exhibitors. Among the equipment exhibitors were names you will recognize today, as a part of our industry. International Crystal, Paraframe, AVCOM for example. And, there was Scientific Atlanta; the "big" SA.

Scientific Atlanta believed, in mid 1979, in the future of private, home terminals. They were, in fact, the **first firm** to offer private, home terminals. They sold for upwards of $20,000, and were capable of four simultaneous channels of service (reception). SA's marketing plan was to sell only big dollar systems, only to rural Americans. They knew that if they tried to sell their product, overtly, into metropolitan America, they would have substantial feedback from the US cable operators and programmers. S/A made a supreme effort to talk the program suppliers into authorizing, for a fee, private terminals. So, too, did another cable industry firm; Gardiner Communications Corporation. Both failed, as you shall see in the first six months or so of the **CSD** Anthology to follow.

That failure drove SA out of the home terminal field, as a **direct** supplier. They would later re-enter through a major cable firm acting as a distributor, and later yet re-enter again through an arrangement with Zenith/Heath Company.



H. PAUL SHUCH - proved to be a very popular lecturer at the first two SPTS sessions. Paul's 12 hour courses turned everyone into instant satellite TV engineers!

The first SPTS was nearly closed down by a Federal District Court!

EARLY SCREEN MESH DISH designed by USTC was displayed at first SPTS. The dish worked fine (13 footer) **but USTC decided against selling in home terminal market.**

At the first SPTS, Bob Cooper announced that this new, brash, young industry was going to need a monthly publication. He offered to create such a publication, and more than 400 people signed up on the spot. And so, **CSD** or **Coop's Satellite Digest** was born.

The first issue of **CSD** was released on September 28, 1979. It was dated for October 1979 and on the front cover was Arthur C. Clarke, the one man who, above all others, could rightfully lay claim to being "the father of satellite television". Clarke penned a description, in the English publication **WIRELESS WORLD**, in October of 1945 telling the world exactly what a geo-stationary satellite system would do, and how it would do it. Clarke's 1945 article was twenty years ahead of reality. It was reproduced in full in the first issue of **CSD**, with Clarke's permission.

The first issue of **CSD** had many things to say. It noted Taylor Howard's statement, before an engineering convention of IEEE members in September, that "Engineers will be engineers. They will do things because they are challenged, and they will consider the consequences later". Robert Coleman, in the first issue of **CSD**, would report on a new device he was building; an "active" mixer. Photos showed how Coleman, using one of Coop's dishes immediately after the SPTS gathering in Oklahoma, produced pictures off of the 20 foot dish, using his active mixer, **without an LNA**! In the same October issue, fellow pioneer John Shelton would report on taking an RCA color TV set module and turning it into an audio recovery system for TVRO use.

The same first issue announced that COMSAT was planning to create a DBS system, using 12 GHz technology, and that they would provide "5 to 6 channels of entertainment and information, at 12 GHz, for individual home 'subscribers'; perhaps by 1985 or 1986". In the report on the first SPTS gathering, it was noted that the "$4,000 TVRO was here". You took a "Kintech dish" plus a 30 dB gain Dexcel LNA and an ICM receiver, and with those three major components, you snuck in just under $4,000. Cable TV terminals, at the time, were selling in the $13,000 range and up. The $4,000 price tag caught the eye of NBC's Jack Perkins who came to Oklahoma City to cover the event for the short-lived NBC Saturday news magazine show. Perkins decided, with host Tom Snyder, that home satellite terminals were curious things for electronic hobbiests, or, rich people to play with. Tom Snyder wondered aloud if Perkins had received one, for Christmas, from NBC yet. Nobody upstairs at NBC was laughing however.

The November 1979 CSD devoted space to Oliver Swan, and his pioneering work with a new type of antenna; the Spherical. Oliver had attended SPTS in Oklahoma City, and spent several hours teaching people how to take some tubing or angle iron, and wire mesh screening, and build a flat-looking square he called a spherical. Oliver explained that the spherical, unlike the parabolic dish, could "see" several satellites at once, without the need for moving the big reflector surface. Oliver would die, of cancer, before the year was out.

The same November issue announced that the FCC had taken an important step; **they deregulated TVRO terminals**. Until that decision, reached in mid-October, every satellite receiving

The October 1979 FCC deregulation of satellite receiving terminals removed the stigma of illegal operation.

terminal was required by FCC regulation to be licensed by FCC. Nobody in the home terminal business was paying much attention to that requirement anyhow, but the fact that such a regulation stood on the books worried people like SA, who had an image to live with. The FCC decision went very far, and even seemed to sanction private, home terminals. The FCC asked the "staff" to prepare a more comprehensive "position paper" dealing with unlicensed, home terminals, and the legal position of the FCC regarding private use of home terminals. The staff said it would do so, promptly. Two years later no such "position paper" had been prepared. That "lack of attention" from the regulatory agency would contribute a great deal to the unfettered growth of home terminals, in the years to follow.

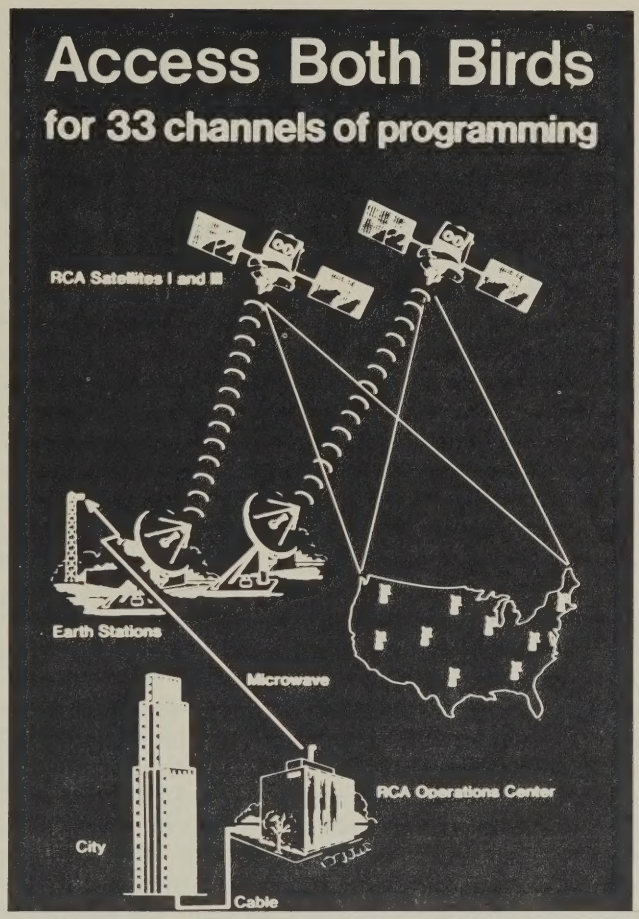
The same November issue reported on Russian satellites that could be seen in some parts (or all of) North America, how systems cope with solar sun "outage", and presented a program schedule for the Canadian ANIK CBC northern service feeds. It also reported that antenna maker AFC, and receiver maker Microdyne, were merging.

What there was of an industry had spent the fall months trying to figure out who it was, and where it was heading. New-to-the-market producers, such as AVCOM and ICM, were busy trying to get production lines started. Most of the equipment **really** being sold was coming from "professional/cable" suppliers, such as Microdyne and MA/COM (then called Microwave Associates). There might have been 50 real, honest to gosh, customer terminals installed during the last three months of 1979; and probably twice that number got into the "pipeline" as demonstration systems bought by new, would-be dealers, in the field. It was all very new, and all very expensive.

On the one hand, suppliers such as AVCOM and ICM were offering receivers at prices thousands of dollars below competitive "pro" receivers. But on the other hand, the pro suppliers could deliver, and ICM and AVCOM could not. So what little "private terminal market" as there was ended up being handled by the established suppliers, already selling cable firms.

H. Paul Shuch made a forecast in December's 1979 **CSD**. Paul suggested that by the summer of 1980, TVRO receivers would be down "at the $1,000 mark". Everyone, Coop included, felt Paul was smoking old transistors. But history would prove his forecast correct.

The December issue also spent a bunch of space discussing the December launch of SATCOM F3. It took off on schedule, after **CSD** went into the mails, and after circling around the earth in a combination low and high elliptical orbit for three days, it disappeared. **Nobody ever found it.** It would be almost two years to the day before RCA got a replacement up, and operating. That would turn out to be the same two years that private home terminals needed, to get an industry off and running.



RCA HAD elaborate cable TV show display showing how their F1 and F3 pair of birds would form 33 channels of basic cable programming. F3 disappeared and the F1 + F3 combo went with it.

Also in the same issue, SA's President Sid Topol said that he felt the problems associated with getting programmers to grant permission to private terminal users was "solveable". Taylor Howard showed us how to improve his receiver IF and demodulator sections. Steve Birkill showed us "yankees" how to receive Russian Molniya transmissions, and the first picture of a private terminal dealer with a trailer mounted antenna, for demonstration purposes, appeared in print. We didn't know where we were going, as an industry, but at least we had a trailer to take us there!

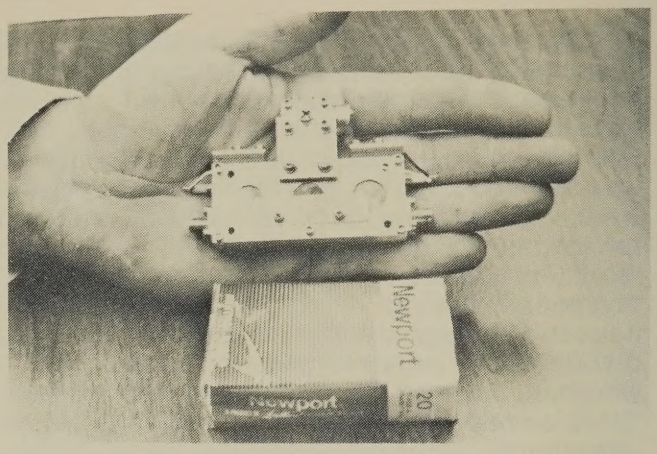
In the January 1980 issue of **CSD**, the industry began to discover how much fun it was to attract a crowd. On the front cover, a trailer mounted terminal parked at a popular downtown San Francisco intersection. Around the trailer, a milling crowd of hundreds of curious, watching their

Loss of F3 set the cable industry back two years, but provided growing room for private terminals.

first satellite TV. The issue went into the basics of building and operating a small cable system, since many readers were showing interest in connecting terminals to several homes each. In the programming area, ESPN, which had begun life by allowing private home terminal viewers to sign up for $1.40 per year, changed its mind and starting asking for $100 as a "lifetime fee". Within months they would quit accepting fees from **any** private terminal viewers, bowing to pressure from the cable TV interests who wanted to keep ESPN an "exclusive-with-cable" service. In the technology arena, Robert Coleman presented a circuit board layout for his active mixer, and **CSD** reported on a "SPACE-COAST" package, a kit which the Florida firm was going to sell for $1200. It was to include an LNA and receiver. It was also turning out that no such package existed, nor would it ever be delivered. The world of fraudulent advertising found its way into the explosive TVRO industry.

Meanwhile, up in Canada, a small community named Faro in the Yukon was the first to feel the crunch of non-coordinated Canadian official policy. Faro had installed a brand new cable system, and since they were more than 400 miles from the nearest television station, a satellite terminal. Without the terminal, no TV at all. The Canadian Department of Communications told Faro they could **not** operate their TVRO; while the Canadian Radio and Television Commission (CRTC) told them they **could**. More than two years later, Canadians would be just as confused about what really was, is, or will be, official policy, as Faro-ites were in the fall of 1979. Finally, in answer to the growing problem of keeping up with what was being transmitted, by whom, where on satellite, there were two announcements in the January **CSD**. One reported that the New York City Metro edition of **TV GUIDE** was now carrying Showtime, HBO and other satellite service listings. The other announced that an ex-cable operator in Idaho would shortly bring out a monthly publication called **SATGUIDE**. The world was looking brighter; or more organized, anyhow!

The February issue was released just ahead of the second SPTS, held in Miami, Florida at the Bayfront Park Auditorium. The Miami SPTS grew to around 20 exhibition booth spaces, and



$50,000 IN HIS HAND - parametric pump, super-cooled LNA module in use at Western Union Vernon Valley (NJ) uplink station can get down to under 20 degree noise temperature.

dragged in some of the larger names in the field; especially in the LNA area. Also in February, it was announced that Clyde Washburn and John Ramsey would be bringing out a kit for a high quality, double conversion receiver. Coop decried the lack of 12 GHz experimentation going on, and cited the need for volume production in the industry. He suggested the industry was growing so fast that it would need 500 TVRO receivers per week before 1980 was over. He was wrong. 200 per week would have been too many, but fortunately nobody was up to even the 200 per week speed.

Also in the February issue, a detailed account, via RCA, of the "F3 Disaster". It was still too soon to see what the disaster really meant in the way of lopsided growth over the next two years, of course. Hughes announced they would build a pair of satellites (later to be called Galaxy), and NEC was advertising single quantity 1.5 dB noise figure GaAs-FETs for $35 each. Technically, things were getting cheaper, and better, in a hurry.

And in the bird news department, Showtime announced it was expanding from a nine hour day to a 12 hour day. HBO kept quiet about the move in public, but planned their own revenge in private. The bird services were starting to compete with one another.

In the March 1980 issue of **CSD**, it became apparent that the industry was growing. If only we could figure out where it was growing to, or why! Miami's SPTS brought out what was described as "fantastic new technology". It was the first show for a couple of guys from Arkansas; H and R Satellite Systems. They wrote over $250,000 in orders in Miami, and went back to Arkansas sure they had struck the mother lode.

The big news highlight from Miami was the group effort, witnessed by perhaps 200 SPTS

attendees, of the first successful reception of an INTELSAT broadcast by a private terminal in North America. A 13 foot STAR antenna, and a 16 foot Paraframe did the job, and in the unseasonable, bitter cold of a February night, more than a hundred curious watched as the Brasilian television network lit up several monitor screens in the front parking lot of the Bayfront. Those who were there will never forget the excitement of the moment.

Technically, the phase locked loop was coming into its own in Miami, and the March **CSD** reported on tricks with this most popular receiver demodulator circuit. Coop forecast that there would be an LNA supply bottleneck by summer, but that paradoxically prices for 120 degree units would start dropping, hitting $750 by July. He would be right on the bottleneck, but missed the $750 forecast by 8 months. Users, meanwhile, were showing signs of concern over antenna gain, and pattern, claims. There was heated debate between attendees as to how universal antenna performance testing could be done, and the information shared. Several suggested, in forum, that the next SPTS conduct antenna tests to compare antennas. It was obvious some **did** work better than others! Coop responded that he didn't see antenna suppliers EVER agreeing to participate in such tests. He was wrong; the summer of 1981, in Omaha, would prove to be the place.

In Miami, the pricing dropped ever so slightly. Ten foot surface dishes, fiberglass, were down to the $800 region, while the least expensive LNA you could buy was a 30 dB gain, 120 degree unit from Dexcel for $995. In the receiver department, AB Electronics / VHF Engineering announced an $1800 unit which they showed in prototype form. Fortunately for everyone, this unit never got into production(!).

Then to pour salt into the deepening wounds in Canada, Paraframe's Jim Vines reported on his experiences with installing a Paraframe terminal at the community of Hixon, in British Columbia. To get the terminal antenna parts into Canada, Vines told the Canadian customs folks he was transporting a solar hot water collection system. TVRO parts, you see, were on the "banned list"! (Fortunately, at the time, Canadian customs officials did not subscribe to **CSD**. Now...they do.)

In the April 1980 **CSD**, the equipment game heated up. Hayden McCullough, fascinated by the earlier work of Oliver Swan, turned the spherical antenna into a product; he called it the "8-Ball". Several thousand 8-Ball, or copies of the McCullough, would be sold in the next twelve months. It would ultimately "introduce" tens of thousands of people to home satellite reception at pricing heretofore impossible; around $600 antenna cost. There was new concern about single conversion receivers (which were not **yet** on the market), and something called "image noise". And the PLL demodulator got a new look from Canadian experimenter Jan Spisar.

In the aftermath of **Miami, it** appeared the orders of Miami were **slowly** being filled; but as readers noted, too slowly to satisfy the demand. RCA announced details on an F3 "R" satellite; promising that it would be a new version, with at least four of the higher power 8.5 watt transponders. They waffled on when it would launch, but said they hoped for mid-81. To back up the F1 overloading of cable services, RCA and COMSTAR announced a plan to put D2 into temporary use as "Cablenet Two". COMSTAR would make available up to 11 transponders for temporary cable use; no more than eight would ever be pressed into service, and the D2 effort would later get low marks from most participants.

The FCC took what it considered a "bold-routine step" when it approved delivery of Ted Turner's WTBS (formerly WTCG) to the American Virgin Islands. Previously, no delivery had been approved outside of the 50 states. Over on Westar 2, Spanish International Network (SIN) began using a transponder to feed 12 hours per day of Spanish langauge television programming to a half dozen affiliated stations.

In the May 1980 CSD it appeared the industry might be shipping 120 full terminals per month. ADM was the largest supplier of antennas, ICM had the receiver business well in hand and LNAs were still priced at $1100 or so.

There were changes coming, however. Taylor Howard announced an agreement to supply receiver technology to an Australian firm. And John Ramsey and Clyde Washburn had a falling out. Ramsey would no longer supply the Washburn

WTCG stood for not much of anything. WTBS stands for "Turner Broadcasting System" and Ted Turner had the call letters changed to reflect better his own image.

receiver, or receiver kit; instead, he announced a new low cost satellite receiver which he promised to show at the San Jose SPTS; price? $995!

Bob Luly, who would later show us the portable umbrella antenna, wrote about a home built LNA using Mitsubishi GaAs-FETs, and a fellow in Denver told us how to use a common florescent bulb to rough-align a home built LNA.

Although the SPACE effort got underway in Miami, at SPTS there, it was not until the July 1980 SPTS in San Jose (California) that it really got off the ground. The May 1980 issue of **CSD** discussed what needed to be done, and why, to protect the industry from itself.

Meanwhile, a firm in Chicago had begun marketing MATV systems to apartment and condo complexes; the price was $40,000 for a terminal bringing in seven channels of service (WTBS, WOR, Movie Channel, Nickelodeon, ESPN included), and the monthly fee to viewers was $7.95. Finally, Ted Turner was having his legal problems trying to find a transponder to launch his new Cable News Network. He would gain court mandated approval for temporary use of F1s TR14, just days before his scheduled June first programming start.

Buried in the back pages of **CSD**, for June, was a late news report; Coop had acquired signals from the Russian Molniya satellite, in Oklahoma. Using an ADM dish and a proto-type Sat-Tec R2 receiver, with a 180 degree spare LNA, it was **the first reception** of a Russian satellite **in North America**. The same issue reported on the increasing problems nations around the US were having with the outpouring of US technology; satellite TV reception services were spreading "off shore",and many of the nations "getting the service" were nervous about it.

The two big technical features, for June 1980, dealt with single conversion receiver designs. Norman Gillaspie told how to build a strip line mixer which took the 4 GHz signal directly down to 70 MHz, without a higher IF. David Barker from GHz Engineering introduced an image canceling mixer that also took the signal from 4 GHz down to 70 MHz in one step. Barker's design would later become the KLM receiver, and the industry would never be the same after it happened.

At the FCC, meanwhile, confusion had set in. There were now more satellite launches requesting orbit spots than there were spots in the sky; if the 4 degree separation was maintained, and if the US respected the prior international agreements assigning orbit areas to US use. Southern Pacific Communications had asked for two spots.

In the history department, the June issue looked backwards at the first real, private or home, receiver unit; designed in mid-1978 by a cable engineer. The half dozen produced were now rare "antiques".

David Barker's image-canceling single conversion receiver sharply changed manufacturing strategies, and made mass production possible.

The July 1980 issue of **CSD** came out just as the clan gathered in San Jose (California), for the third SPTS event. San Jose would be remembered as a good, fun show with lots of new technology; as the August issue would report. Steve Gibson revealed the secrets of tracking satellites across the sky with various types of antenna mounts, and Coop gave a detailed report on how you too could tune in Moscow transmissions via Molniya. A public display of Molniya reception would be a highlight of the San Jose gathering; hundreds would watch the Moscow signal for hours on end, gathered around a small monitor adjacent to the Hyatt Regency pool.

The same July issue reviewed the technical performance of the new $995 Sat-Tec R2 receiver, and found it surprisingly good in performance for the low price. Also in the equipment reviews was an audio sub carrier detector designed and sold by a fellow named John Rohner. Rohner was promising to show a $1500 LNA plus receiver package, in San Jose, and the industry was very excited about the prospect of getting

CONTROL CENTER / SPTS - Seminar events include videotaped programming, fed through the host master antenna system, to the rooms of attendees. Here SPTS veteran Gary Willhoite mans the two-channel-out system at SPTS San Jose.

both units for approximately the cost of the receiver alone.

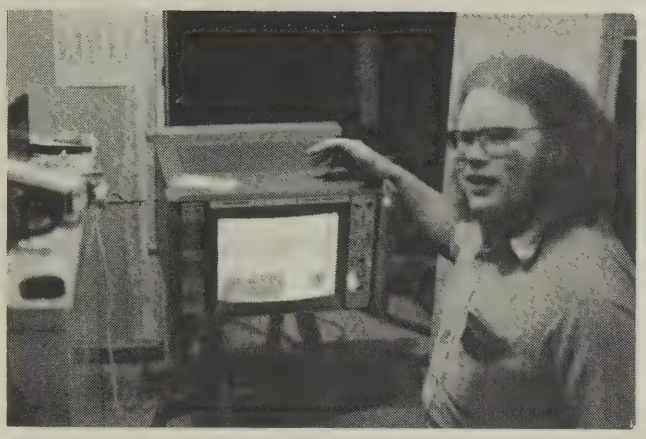
Finally, HBO announced it would be taking off the air something they called "Take 2"; a G and PG family service, which had been running on transponders 20 and 23. To replace it, HBO would introduce Cinemax, a 24 hour per day service.

The August issue of CSD for 1980 was the 11th issue of the new publication. San Jose and its activities occupied a considerable portion of the issue. John Rohner's $1500 LNA plus receiver did **not** show up, as promised, at San Jose. But Bob Luly and his umbrella antenna did. And the umbrella antenna stole the show. Here, for the first time, was a ten or twelve foot surface that folded up under your arm for easy transport, almost anyplace in the world! Luly would have difficulties getting into production, but the concept was sound and the antenna did work! A firm calling itself SATRX displayed at San Jose, showing a receiver that would later turn out to be one designed largely by Taylor Howard for sale in Australia. The coming and going of SATRX would be a mystery for years; it eventually went after delivering only a handful of receivers "stateside".

SPACE got off the ground in San Jose, and none too soon. Just before the San Jose gathering, a North Carolina Congressman had introduced a piece of legislation which would create monetary fines of up to $250,000 (!) for anyone caught watching satellite TV programs which they were not authorized to view. SPACE elected, or appointed as you will, pioneer Taylor Howard to be the first SPACE head, and selected a Board of Directors. Attorney Rick Brown would staff a Washington office for the group, and coordinate the lobbying against the bill.

The Satellite Program Network (SPN) picked July to move off of F1 transponder 21. SPN, owned and operated by the WTBS carrier SSS and Ed Taylor, had found a monied customer for TR21, and they decided that the time had come to "split" from F1 and start a new cable bird. Armed with the funds received for the sale of TR21, they headed to Westar 3, transponder 9. To sweeten cable firms following them there, SPN offered free TVRO antenna and LNA packages (valued at $2500 plus each) to more than a hundred of the larger cable firms. At the time, it was announced that the San Francisco / Oakland independent, KTVU, which had been carried on F1 TR1 for more than a year, would shut down service on December 31st. Warner had purchased the transponder, and would be moving Nickelodeon there.

The final issue of the first year of private terminal activity, September 1980, included a reader certificate that authorized each reader to be a legal viewer of CBN, transponder 8. This got many readers off the hook for it gave them a "legal transponder to view"; just in case the threatened legislation came off. The legislation threat looked real at this point, and there were murmurs of a dying industry in that issue; **if** the bill passed.



AN EXCITED YOUNG MAN - Tom Hill of Beaverton, Oregon shows off his first successful acquisition of Russia's Molniya satellite in the summer of 1980.

The same issue announced the Houston SBOC gathering, and Taylor Howard detailed how you could convert the popular Chaparral feed to right hand circular polarization; to improve (by up to 2 dB) the reception results with Molniya, Ghorizont and other circular polarized satellites.

The viewing excitement was being provided by the US-boycotted Russian Olympic games. Down in Florida, a fellow named Bob Behar was making the wire service news reports, and US network television, by dragging in fulltime coverage of the Russian games via Ghorizont and other satellites.

Closer to home, Gene Autry announced he would begin an evening feed of something called VEU to a half dozen affiliated, STV stations shortly. And Showtime announced that they had plans for transponder 17 (then sub-let for WOR use) on F1; they forecast that WOR would leave the air, on TR17 at least, before the end of 1981. It would later turn out to be mid-1982 before WOR got bumped. And Cinemax started up 24 hour per day service on TR20 for the east coast, with TR23 for the west coast to follow during the month of September.

The second year of CSD began on a technical note. Norman Gillaspie and John Rohner were back with circuit details on an NEC two stage home brew LNA; backed up by a biasing circuit for improved LNA performance. Hayden McCullough showed us how to use a **pair** of low cost spherical antennas, to cover most all of the then existing orbit belt; "still cheaper than a parabolic that moves" Hayden suggested. Steve Birkill came through with a low cost oscillator for

tuning the 3 to 4 GHz region.

It was apparent that, as the October and November issues reflected, the industry was becoming more concerned about refinement of existing circuits, than the creation of whole new approaches to satellite reception. Hardware continued to be in short supply, and there were rumors of a growing worldwide market. Taylor Howard was in Australia trying to get a private terminal industry started there; and to back it up, Australia announced they would begin "tests" using a 4 GHz Intelsat "spotbeam" transmission for delivery of television programs to rural areas.

The threat of legislation suddenly ended, the result of intense lobbying from SPACE President Taylor Howard and VP Richard Brown. The bill ended up in limbo; as the Congressional session drew to a close and as the clan gathered in Houston for the Satellite Business Opportunity Conference, the mood was upbeat.

How the industry was marketing or selling hardware became a big concern, however; heightened by the near miss with legislation. Many sellers were openly telling customers, or would be customers, that private satellite terminals could be used to tune in program services such as HBO. And HBO, and others who felt threatened, clearly did not care for that type of attack on what they considered "private property". The October and November issues tried to sort all of this out, urging the industry to "clean up its marketing act" before somebody else did it for us!

1980 ended on a mixed note. Some problems with the Sat-Tec R2(A) receiver were found in the field, and **CSD** reported on the fix. An outline for distributing TVRO signals in apartment and condo complexes, using "mid band" TV channels for security, was discussed. LNA noise, from the image frequency, was proving to be a problem, and ICM had brought out a Taylor Howard designed "fix" for this problem. **CSD** also took the December 1980 issue to explain how a fellow could qualify, in FCC eyes, as a "small cable system"; what the rules were and how they created problems for the terminal operator anxious to sell satellite services into small cabled areas.

The folks at **Sat-Guide** magazine, meanwhile, were feeling pressure from programming firms such as HBO. HBO reportedly had warned **Sat-Guide** that **if** it continued to promote its publication to private terminal viewers, HBO would see that **Sat-Guide** no longer received HBO program listing information. On another "security" front, Oak Industries had scrambled the Ali-Holmes fight, and from most reports the scrambling had cut way down on unauthorized viewing. Showtime announced that it would soon be 50% owned by the giant Westinghouse Corporation.

The January 1981 issue proclaimed Taylor Howard as the industry's **Man of the Year**. Howard's contributions in engineering, equipment design, teaching at SPTS and SBOC gatherings, his heading up of SPACE when the industry needed a leader, and his pioneering in Australia, all added up to a far ranging, active year for the man, and the industry.

The fall-out from the SBOC in Houston was very evident. KLM reported their Barker designed single conversion image-reject receiver was up to 300 units shipped per month. The Houston show had perhaps 800 people in attendance, with 22 operating antennas and 40 equipment booths. Hundreds of new dealers found their way into the industry at the Houston show; although many of those would fail, and go on their way, in the coming months.

Rumors persisted that Dexcel was going to come out with a two-piece receiver; LNA plus down converter in one box, at the antenna; the demodulator portion inside. They would show it in April at the next SPTS event, and finally started shipping late in the summer of 1981. Clyde

HBO and others were clearly upset by private terminal advertising offering "unlimited viewing" of HBO (etc.) services.

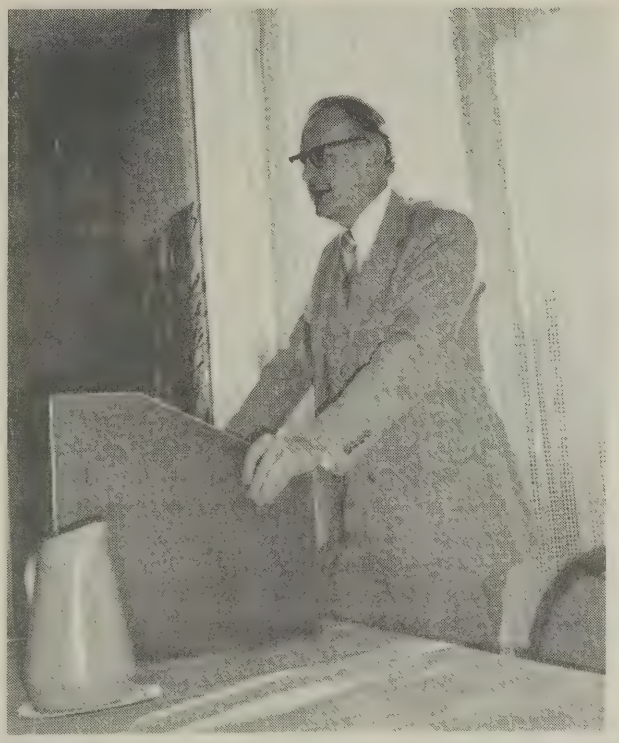
SUPER STATION? Yes, Los Angeles KTTV was a bird super station for a short period of time; on Westar II. The company behind it failed.

Washburn would announce that his firm would no longer take orders for receiver kits, because, he noted, "all of the wrong people are buying the kits". The Washburn receiver was going through a transition; it was about to become Earth Terminals, Inc. Pioneer Robert Coleman, through H and R distributing, displayed a double conversion receiver at the Houston show. It would develop slowly, as an H and R exclusive, in the year ahead. A Canadian group, Teknimat, also selected Houston to show off a new "videophile" TVRO receiver; a unit that would splash even bigger at Washington, DC in April, and then slowly drop out of sight before the end of 1981.

There was plenty of talk about receiver quality in January; plainly many people were getting factory shipped radios which didn't work very well, if at all, when the cartons were opened. This concern would grow even greater during the full year.

There was plenty of newly announced programming and bird activity in January. The Colombian government announced it would launch a pair of DOMSAT birds to bring telephone and television to remote areas. NBC announced it would use a COMSTAR bird to start testing the feed of the full network schedule to selected affiliate distribution centers. They said it would start in May of 1981, but as of February of 1982, it had still not happened. And over on Westar 3, a firm called Satori was defending its new "R" rated service by assuring people it was not "X". There ensued a battle of words as to what constituted "X" service. **Private Screenings** would last less than the full year, falling into financial problems.

FANFARE WHO? Here is another one that made it for awhile, and then died. FANFARE was operating on transponder 16 on F2 serving up movies and sporting events to Texas, New Mexico and a few surrounding states; sort of a regional HBO. It sold out to Showtime, who today owns transponder 16.



RCA PRESIDENT ANDY INGLIS performs the difficult task of advising the industry that F3 had "disappeared". RCA kept searching for bird for several weeks, finally collected more than $70,000 in insurance.

By the February 1981 issue of CSD things were beginning to shape up for the forthcoming April SPTS. The event would be held over the Easter weekend; not because anyone wanted it that way, but because on such short notice, there were no other "open dates" available. Coop suggested a number of design goals for engineers for 1981. In the antenna area, he said "Big, bulky antennas are an impediment to commerce" and he urged the industry to figure out a way to get antennas into smaller shipping containers; without sacrificing quality of performance. National Microtech, new as a national distributor, would shortly show us how to do just that with their 9.4 foot "X" series antenna.

Coop also warned the industry that more attention was needed on good quality, motorized mounts. The rapid proliferation of new satellites, and the new programming services, moving to additional satellites, was making the day of the one-bird-antenna obsolete in a hurry.

The February issue had an equipment review for the Washburn/Earth Terminals receiver. **CSD** found the receiver to have as good, or better, sensitivity as any private terminal receiver on the market, and the "quality of the video is substantially better than anything else tested to date".

SPACE was on the offensive. Filing strong

objections at the FCC, the trade association was trying to block the acquisition of TelePrompter/ Showtime by Westinghouse, charging that Showtime was engaging in anti-competitive practices by not allowing private or SMATV systems to contract for their service(s). Senator Goldwater let it be known that he was installing his own private terminal, in Arizona.

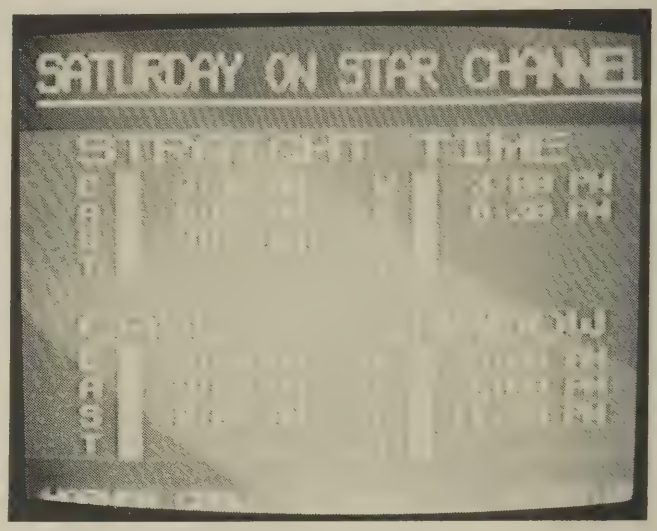
In the technical area, the ICM purifier was proving to be a "fix" for TVRO LNAs with an "image problem", although at least one LNA supplier would later object violently that **CSD** reported this problem with their unit. And WGN's signal was found to have a non-30-hertz "dither"; resulting in some flickering from the signal on certain demodulators. LNAs dropped in February; down to $795 for single units in the 120 degree range. The format for the year was being cast, but the "depression" in sales was not yet evident.

The LNA price war was on, as the advertisements in the March 1981 issue stated. 120 degree units were now $695 and headed down. LNA supplies, it appeared, were finally catching up with the demand, and to keep the product moving, OEM's were making more and more attractive deals with distributors. On the front cover for March, Puerto Rico's Bill Larsen displayed his 28 foot home designed and constructed spherical; a huge antenna that worked extremely well on even the weak (in the Caribbean) F1 signals. Low power TV was in the headlines. The FCC had approved 1 to 1,000 watt stations back in the fall of 1980, and **CSD** saw an obvious marriage between home terminals and the sharing of services with neighbors; using LPTV technology. The subject would get a thorough going over at the Washington SPTS this month. But alas, the FCC was proving to be incapable of handling the thousands of applications being filed, and by the end of 1981 only a **single** LPTV station would be operating.

Ted Turner donated a TVRO to Congress, to connect to the MATV system that allows members of the House and Senate to keep up to date. Turner's CNN was now seen by all. SPACE was making points in Washington, also, increasing the broadside salvo fired at the proposed Westinghouse take over of cable giant TelePrompter, and its 50% ownership in cable programmer Showtime.

The April 1981 issue of CSD concentrated on the legal and technical problems associated with

LNA prices dropped sharply when supply caught up to demand.



STAR CHANNEL? Who is that? That was what they called The Movie Channel at first. The service has always suffered from trying to satisfy both ends of the USA with a single transponder. In the early days they tried to group programming for both, and failed miserably.

bringing US satellite television down into the extremities of the Caribbean, and northern South America. The few terminals operating in that region of the world were facing uncertain legal status, and difficult engineering challenges. Later in the year, the FCC would open the door a crack, to allow legal use of American domestic satellites in the Caribbean, provided both the sending (US) **and** receiving countries agreed on a country by country basis.

Vidiark went into the receiver business, adding three models to a growing supply line, and expanding out of the spherical antenna field. Polar mount technology got a thorough going over by Ronald Waltner, and the SatFinder automated dish system got praise from Coop.

In the operations area, SPACE was forecasting a real breakthrough, still, with program supplier permission; WGN was changing to a new microwave feed between Chicago and the Lake Geneva (Wisconsin) up link site, after years of troublesome service; and, COMSTAR D4 was rational. But no TV on it, yet.

May of 1981 brought us into the first industry doldrums. We didn't know it at the time, but sales were down and the product was stacking up in the pipeline. For the first time, there was more product than demand, and this was making many manufacturers nervous. Adding to their concern, SPACE was having a difficult time raising the funds needed to battle the FCC, Congress and the courts. SPACE finally created a Pioneer member category, and those firms supporting this level were asked to put up $300 each per month to keep the legal battles from becoming legal wars.

Scientific Atlanta reminded us all that "Homesat"® is their own registered trademark; the Omaha SPTS was announced, complete with an "Antenna Shoot-Out At The OK Corral".

CSD devoted several pages to investigating the problems caused by single conversion receivers; the oscillator interference between receivers was starting to get on people's nerves at the SPTS shows, and some were concerned that an FCC regulation or two may be getting broken here.

Rumors were now every place that RCA would NOT launch F3R in mid summer, as promised. Canada moved the A-2 bird, old and ailing, to the A3 position and the two would operate as a unit, until a replacement would launch years later. The FCC said "uncle", and said no more LPTV applications would be accepted. Buried under more than 5,000, over half of which had not even been envelope-opened, it looked like too much of a good thing had shut down the agency.

And the Space Shuttle finally flew, allowing (via COMSTAR) thousands of excited South and Central Americans to view their first, live, US event.

June 1981. Excitement is building for the forthcoming Omaha SPTS. A temporary dip in sales seems to be receding. Antenna manufacturers are signing up to allow their antennas to be gain-measured in Omaha. Everyone is in a hopeful mood.

Channel Master picks now to announce that they will be in the marketplace, with 10 and 12 foot terminals. They select the KLM receiver, and an Az-El antenna combination. Springing their announcement, formally, at the Atlanta Electronics Distributor Show, reports have it that they sell $5,000,000 in equipment at the first show. But alas, their ability to sell, and their ability to deliver, prove to be two different things; and as 1981 winds to a close, people are saying "Channel Who???".

Winegard and Blonder Tongue also announce TVRO terminals, but hedge their bets by qualifying their sales interest solely towards (S)MATV systems. BT will sell a Scientific Atlanta package; Winegard will go first with a 10 footer from Prodelin, and MA/COM electronics.

Motorized dishes are coming on fast. Comm-Tech shows a motor driven array, and Omaha starts to look like the "motorized antenna show". The June and July issues of **CSD** reflect the mood of the times. An expose of John Rohner's activities angers Rohner, warns others, but accomplishes nothing in the way of Rohner reform. At the end of 1981, Rohner is still peddling his equipment to gullible buyers.

RCA finally admits they cannot launch in mid-summer; re-set mid-October for F3R. It will be late November before F3R **does fly**, but when it finally comes on line December 28th, the pictures will be so improved for **most** viewers, RCA will be forgiven for being late. The Canadian group, CANCOM, approved by their government to bring up four separate Canadian "super signals" on Anik 2-3, announced they plan to scramble using Oak equipment, and charge $4 per month for the four signals; per home. Many wonder how a $4 a month charge can equate, when the descrambler unit will cost CANCOM $1,000 each; or more.

HBO HAS HAD SOME STRANGE PARTNERS - including the NHK network in Japan during the 1980 Winter Olympics; feeding programming to Japan first via TR22 on F1, which then went on to Japan via INTELSAT.

In response to industry concerns about dish performance, Steve Gibson authors a piece that tells people how to check a dish for accuracy using simple math and hand tools. And in a whimsical, but true look at the problems associated with off-shore TVRO service, a Canadian writes about his experience producing satellite pictures in Haiti; to make the antenna work, he had to re-fashion a piece of waveguide from a piece of sewer pipe. Where there is a will, there is a way. Even in Haiti.

The month of August tickled the future of home satellite terminals. It portrayed a new system, reportedly developed for off-shore applications, wherein one satellite terminal would receive all 24 transponders (from a vertical plus horizontal bird), and then relay those (up to) 24 channels directly into surrounding homes using UHF broadcast frequencies. In the homes, inexpensive UHF tunable television receivers did the final demodulation job. It all **looked** so good. Unfortunately, when shown in Omaha in August at SPTS, it worked far below expectations.

SPACE, the trade association, was at another crossroads in August. It lacked the **broad** support so badly needed to operate, and was in

danger of becoming a private "law club" for a handful of major manufacturers. It didn't look good at the time, but later in the year, at the Anaheim SVC gathering, everything would turn around for SPACE, and its new Board of Directors. All's well that ends well.

On the happier side, the Canadian TVRO industry got an important court decision; a British Columbia court ruled that the federal government had no business closing down, and confiscating, an apartment complex TVRO system that was feeding four US signals into more than 600 apartments. The Canadian government said it would appeal, but it did not.

There were changes in bird operations. VEU, the Gene Autry service begun just under a year before, closed down and the feed and transponder space taken over by SelecTV; another STV outfit. WGN's common carrier, United Video, finalized its audio sub-carrier program by placing four audio sub services, along side the WGN main carrier; one each country and western, top 40, and middle of the road, plus popular WFMT. And a major supplier of pro-grade TVRO receivers, CommTech, dropped the price of its 24 channel receiver, to $1870.

The end of year two came as abruptly as the first year began. The September issue of **CSD**, for 1981, reported that 51 antennas, 1200 people and 90-plus exhibit booths filled the Holiday Inn to overflowing for four solid days of activities. The antenna shoot out came off with no major hitches; the results published in the September issue clearly showed wide variations between dishes of the same size. Bob Luly came close to topping his umbrella antenna, by announcing the "Luly Polarizer", an electronic gadget that "magically" rotated the polarization of signals without moving the feed, or, mechanically turning anything. LNA prices dropped to $575 on the open market, and reports indicated $20,000,000 in orders were written in Omaha.

The same issue found Heath(kit)/Zenith plus Scientific Atlanta announcing a $6995 priced home terminal, and Australia busy installing private "community" terminals; largely using 7 meter sphericals designed by Taylor Howard.

Cuba had begun to use the Russian Ghorizont satellite, at 14 west, to transmit daily program fare to several Central American and Caribbean countries; that experiment would be on and off all fall, never really becoming a permanent fixture. Bob Behar's Hero Communications was back in the news. First, Behar made two trips into the eastern Caribbean with a Luly umbrella antenna, where he found weak but useful signals from F2 and F1 at Barbados and St. Maarten; even at look angles as low as 5 degrees. And to complete the full circle of our two years, Behar's firm pulled off a nifty sales coup by selling four terminals to the prestigious Post Newsweek broadcast station group. The amateur guys had come through to outbid, outsell and outperform the "pros" who started all of this!

The Next Two Years

The industry began at a very low level of self esteem. Growth the first year was painfully slow. It took ICM nearly twelve months to get up to 100 satellite receivers per **month**. ADM, one of the leading antenna suppliers since the first month of 1980, got up to 100 per **week** before the end fo **CSD's** second year.

Moving product, in volume, became the name of the game. One on one, customized installations gave way to "slam-bam, thank-you mam". And many of the new-to-the-field installer/dealers paid the price of inexperience.

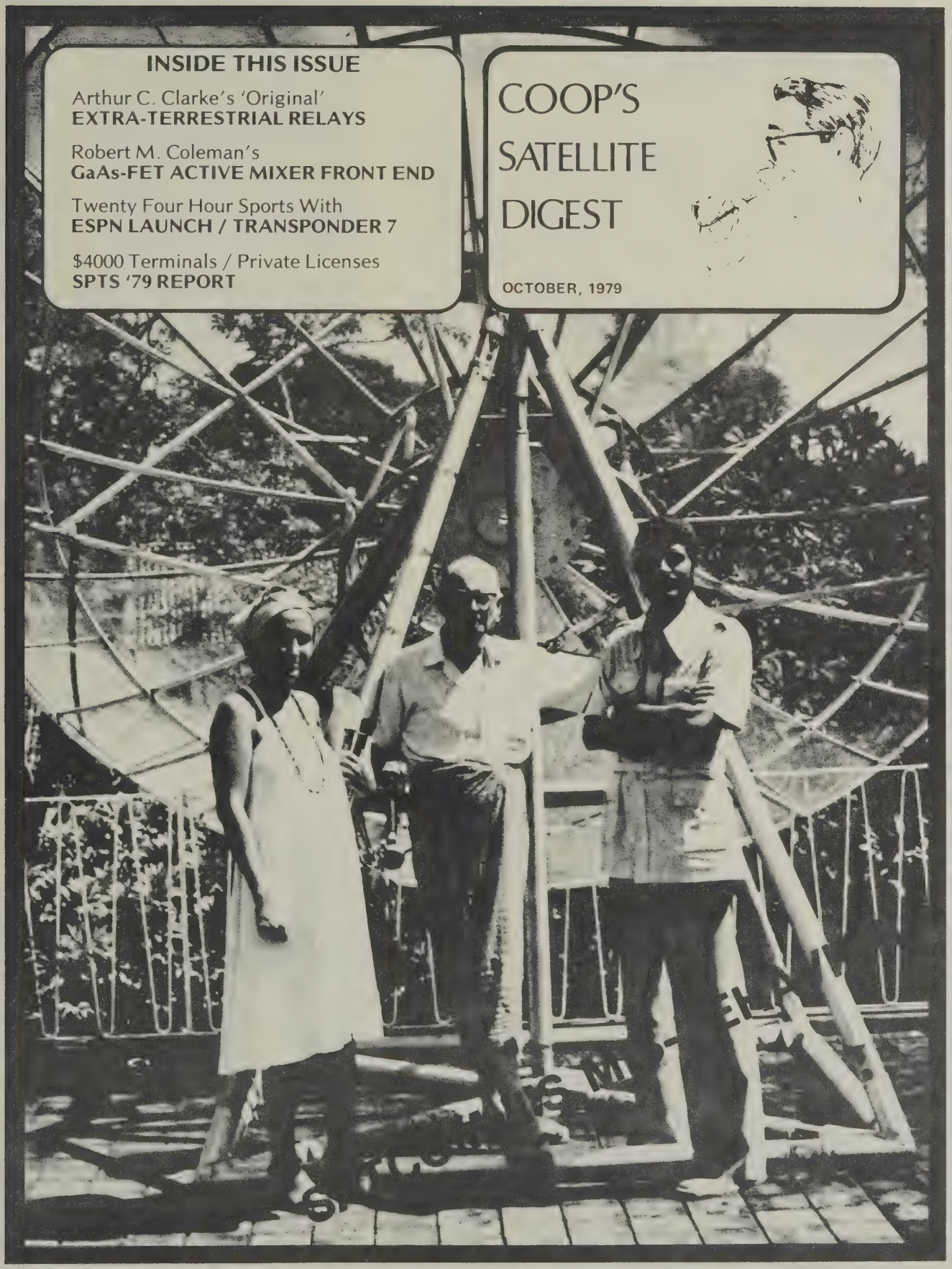
There is no way to measure how many firms tried to handle, and install, TVRO hardware during those two years. The turn over in the **CSD** subscriber list indicates perhaps half who tried, failed, and it may in truth be far greater than that.

Getting in early was no guarantee of success. Of those handful who displayed at the first SPTS, only AVCOM can be said to have made a permanent and continuing "dent" in the marketplace. ICM's products have stayed with us from the first, but they have not always done well in the marketplace. People such as Jim Vines (Paraframe), who were in place **before** there was an industry, and who contributed mightily to the early growth of the industry, have often become reclusive and very low key.

Like most endeavors in life, there is the element of luck, being the right person at the right place, associated with all that has happened. But there has also been opportunity present for the early pioneers. Those who have succeeded have been those who have persevered, overcoming the obstacles, and never losing sight of the big game being played all around them.

What will the next two years bring? Some of the game plan is already evident; four new US domestic satellites during the waning days of 1981 through 1982, with 96 new transponders; to be followed by an equal number of additional, new, transponders via yet newer birds in 1983. Each new bird will offer new excitement, reception opportunities and challenges. The future is bright, **and you ain't seen nothing yet!**

Provo, B.W.I. / "Coop" 3-15-82



INSIDE THIS ISSUE

Arthur C. Clarke's 'Original'
EXTRA-TERRESTRIAL RELAYS

Robert M. Coleman's
GaAs-FET ACTIVE MIXER FRONT END

Twenty Four Hour Sports With
ESPN LAUNCH / TRANSPONDER 7

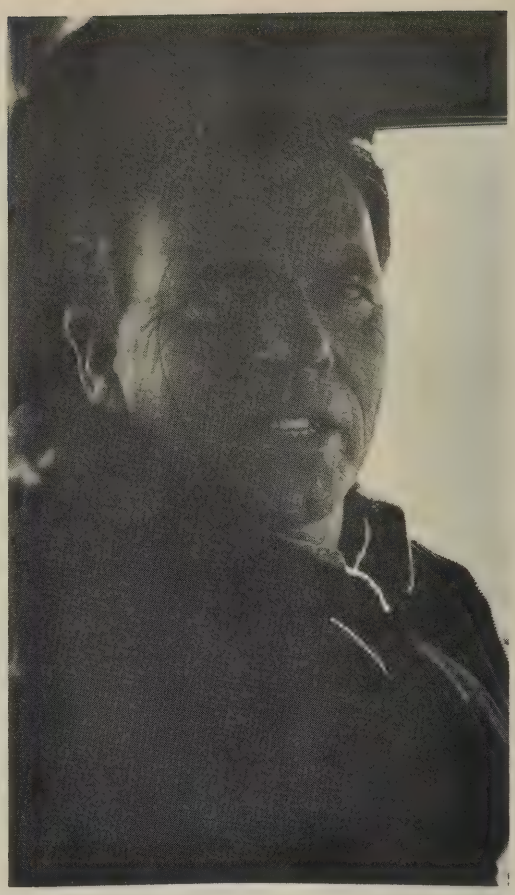
$4000 Terminals / Private Licenses
SPTS '79 REPORT

COOP'S SATELLITE DIGEST

OCTOBER, 1979

OLIVER SWAN–

talks about Spherical TVRO antennas.

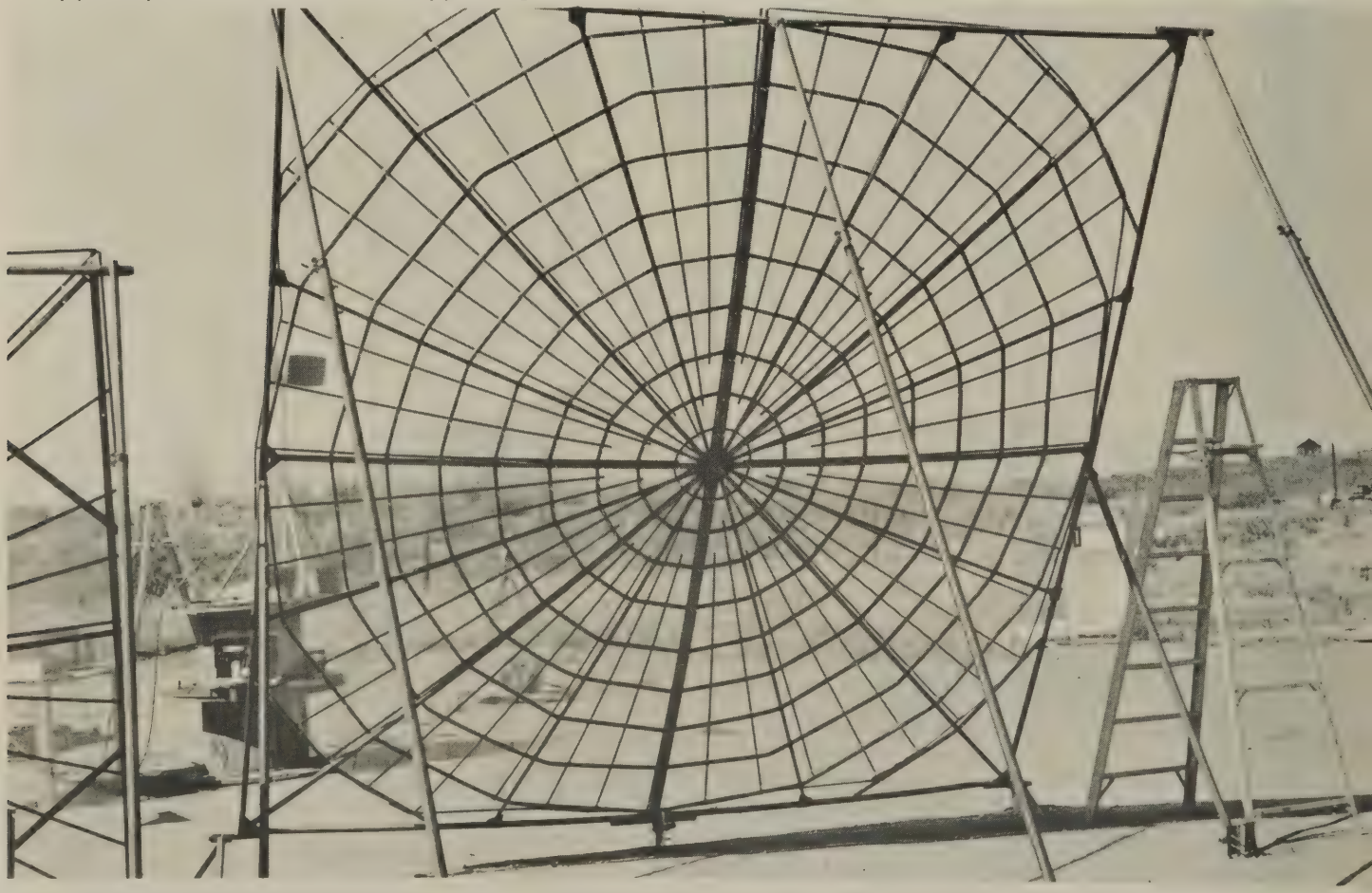


Oliver Swan's antenna exploits are legendary. And now he's done it again. A complete series (from ten feet to as large as you want or need!) of 'Spherical' antennas for simultaneous reception from up to 9 geostationary satellites spaced at 4 degree intervals!

Extensively tested by TV stations, cable companies and a major TV network, the Swan Spherical series of TVRO antennas are lightweight in design, quick to install, and have low wind loading because of the mesh relector surface recommended. The Spherical has many advantages over normal parabolics, including the multiple-satellite visibility. **AND** - they are far less expensive than comparable 'full dish' parabolics!

Best of all, **you can build it yourself**. Using locally available materials and local labor. The **SWAN SPHERICAL TVRO ANTENNA MANUAL** tells you how. In detail. Complete construction information on the Swan Spherical antenna series and the 'deep throat' feed horn is yours for the paltry sum of $30. With this instruction manual, around $300 in materials and approximately 40 hours of construction time you'll have a ten foot Spherical up and running.

The **SWAN SPHERICAL TVRO ANTENNA MANUAL** is another in the series of "learn-by-doing-manuals" available exclusively through Satellite Television Technology. The price is $30 postpaid in U.S. and Canada; $35 elsewhere. Order your copy today from the STT address appearing below.



SATELLITE TELEVISION TECHNOLOGY
P.O. BOX G
ARCADIA OK 73007 (405)396-2574

COOP'S SATELLITE DIGEST T1 - 10/79

COOP'S COMMENT ON TECHNOLOGY

SENSE OF HISTORY

To the 2,500 or so individuals and firms receiving this (first) issue of CSD, year's from now you may look back on the October 1979 issue of **Coop's Satellite Digest** and consider it to have been the 'beginning of a telecommunications era'. To 500 or so others, the 'private / low-cost satellite TV terminal' era may have begun **at SPTS '79** held in Oklahoma City in mid-August of this year. To still others, my **TV GUIDE** article appearing in October of 1978 may have marked the 'turning point'.

It is more appropriate, if historians will one day trace the origins of satellite television, that we start at the very beginning. On our front cover this month we are particularly honored to have Arthur C. Clarke; the one individual who really began it all. Not in 1979 or 1978 but back in 1945!

Arthur C. Clarke is a truly unique individual in a world filled with unique individuals. On pages 2 through 5 here this month we present the published work that really **did start** the satellite revolution. Keen sighted readers will notice that we are reprinting from **WIRELESS WORLD** a Clarke article appearing in October of that year. Read it carefully. Consider as you read this origin's piece that Clarke was writing at the close of the Second World War; that anything above 100 MHz was considered black art, that artificial satellites were hardly even a concept, and that the rocketry required to launch such a system was not even contemplated. Not by anyone ... other than the extremely far-sighted Arthur C. Clarke.

Arthur C. Clarke, author, space visionary, lecturer, and underwater explorer and scientist. Clarke was a radar instructor for the RAF during 1945. He subsequently was a technical officer for the first GCA (Ground Controlled Approach) system in the world and in 1948 he received a B.Sc. in Physics (Pure and Applied Maths) from King's College in London. Today Arthur C. Clarke resides in Columbo, Sri Lanka where he has headquartered while engaged in underwater exploration of the coast of Sri Lanka (Ceylon) and from which he engaged in numerous trips to the Great Barrier Reef in Australia since 1954 for additional underwater exploration.

On our front cover Arthur C. Clarke (in the middle) is standing before a 15 foot screen-mesh parabolic which was presented to him in Columbo as a gift of the Indian Government during the Indian 1976 SITE experiments on 860 MHz. During this ATS-6 experimental program Clarke was able, some thrity years after he first hypothesized geostationary satellites, to witness first-hand the operation of such a system. You may recognize Clarke's name from other abilities this multi-talented individual has developed. His writings, in non-fiction and fiction areas, have been prolific. With Stanley Kubrick Clarke authored **2001: Space Odyssey.** From his own hand has come more than 50 others including **Tale of Ten Worlds, The Lion of Commarre, The Lost Worlds of 2001, Expedition to Earth** and (with the astronauts) **First On The Moon.**

Arthur C. Clarke is quite a guy. And I wanted to set the record straight, from the very beginning. Read our first feature here this month and remember as you do that it was the very imaginative and fertile mind of Arthur C. Clarke, **back in 1945**, that really started **all** of this geostationary satellite business!

ENGINEERS WILL BE ENGINEERS

H. Taylor Howard is a modern day Arthur C. Clarke. Tay's work in developing the first privately created and funded operational TVRO receiving terminal in the summer of 1976 is a matter of record. His professional work at Stanford University is, in his field, legendary. Tay observes that **"engineers will do things because they are engineers and because they consider a project 'do-able' ". In short, an engineer 'challenged' by a concept will tackle a project for no reason other than the challenge that it presents.**

Taylor, H. Paul Shuch, John Bacon from HOMESAT and Mike Fornicari of DEXCEL participated in a panel on low cost, private (TVRO) terminals during the Western Electronics Convention (WESCON) in mid September in San Francisco. WESCON always draws a big crowd because it is a superb new-technology exhibit but its' sessions, where one goes to sit down and learn, are usually sparsely attended. **This session broke all records**; a room capable of seating 350 was filled with more that 500 and people stood in the aisles and out the doors. Much of the 3 hour plus session centered on a non-engineering matter; the legality of receiving satellite signals on a private basis. HOMESAT's Bacon noted that his firm wants users to be leagally entitled to receive what they look at, but noted **"we favor de-regulation of licensing"**. Taylor brought the house down with his off-hand observation that Section 605 may end up in the Supreme Court since many feel that 'personal benefit' only occurs when the users receives money or something of value from the 'interception of a transmission'; and noting that many people feel **"as long as those photons are falling on my ground they** (the satellite operators) **can damn well keep them off my head if they don't want me using them!"**.

Hundreds of new enthusiasts were turned onto satellite TV by the Shuch created WESCON panel and since virtually all were engineers we must observe that since engineers will continue to be enginners, new developments in the technology side of the equation are probably already being created in workshops across the country. **There is no stopping** this **technology revolution!**

CSD TECHNOLOGY

COOP'S SATELLITE DIGEST (Technology Edition) is produced monthly by Satellite Television Technology, P.O. Box G, Arcadia, Oklahoma 73007 (405-396-2574). CSD is available in two separate editions (Technology and Programming) or as a combined subscription. Subscription rates are $30 per year for first class mail delivery within U.S.A. or Canada for either edition, or $50 per year for the combined editions. Outside U.S.A. add $25.00 per year for any subscription. All subscriptions to be paid in advance in U.S. funds drawn on a U.S. bank; no invoicing. Contents are copyright 1979© by Satellite Television Technology and any duplication or reproduction in any form without written permission is a violation of Federal Statue (17 USC 101 et seq.).

305 October 1945 Wireless World

EXTRA-TERRESTRIAL RELAYS

Can Rocket Stations Give World-wide Radio Coverage?

By ARTHUR C. CLARKE

ALTHOUGH it is possible, by a suitable choice of frequencies and routes, to provide telephony circuits between any two points or regions of the earth for a large part of the time, long-distance communication is greatly hampered by the peculiarities of the ionosphere, and there are even occasions when it may be impossible. A true broadcast service, giving constant field strength at all times over the whole globe would be invaluable, not to say indispensable, in a world society.

Unsatisfactory though the telephony and telegraph position is, that of television is far worse, since ionospheric transmission cannot be employed at all. The service area of a television station, even on a very good site, is only about a hundred miles across. To cover a small country such as Great Britain would require a network of transmitters, connected by coaxial lines, waveguides or VHF relay links. A recent theoretical study[1] has shown that such a system would require repeaters at intervals of fifty miles or less. A system of this kind could provide television coverage, at a very considerable cost, over the whole of a small country. It would be out of the question to provide a large continent with such a service, and only the main centres of population could be included in the network.

The problem is equally serious when an attempt is made to link television services in different parts of the globe. A relay chain several thousand miles long would cost millions, and transoceanic services would still be impossible. Similar considerations apply to the provision of wide-band frequency modulation and other services, such as high-speed facsimile which are by their nature restricted to the ultra-high-frequencies.

Many may consider the solution proposed in this discussion too far-fetched to be taken very seriously. Such an attitude is unreasonable, as everything envisaged here is a logical extension of developments in the last ten years—in particular the perfection of the long-range rocket of which V2 was the prototype. While this article was being written, it was announced that the Germans were considering a similar project, which they believed possible within fifty to a hundred years.

Before proceeding further, it is necessary to discuss briefly certain fundamental laws of rocket propulsion and "astronautics." A rocket which achieved a sufficiently great speed in flight outside the earh's atmosphere would never return. This "orbital" velocity is 8 km per sec. (5 miles per sec), and a rocket which attained it would become an artificial satellite, circling the world for ever with no expenditure of power—a second moon, in fact. The German transatlantic rocket A10 would have reached more than half this velocity.

It will be possible in a few more years to build radio controlled rockets which can be steered into such orbits beyond the limits of the atmosphere and left to broadcast scientific information back to the earth. A little later, manned rockets will be able to make similar flights with sufficient excess power to break the orbit and return to earth.

There are an infinite number of possible stable orbits, circular and elliptical, in which a rocket would remain if the initial conditions were correct. The velocity of 8 km/sec. applies only to the closest possible orbit, one just outside the atmosphere, and the period of revolution would be about 90 minutes. As the radius of the orbit increases the velocity decreases, since gravity is diminishing and less centrifugal force is needed to balance it. Fig. 1 shows this graphically. The moon, of course, is a particular case and would lie on the curves of Fig. 1 if they were produced. The proposed German space-stations would have a period of about four and a half hours.

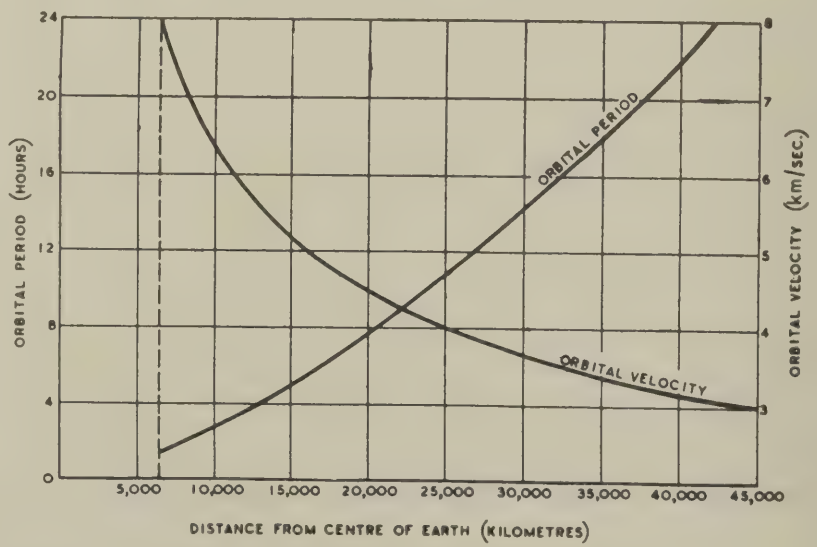


Fig. 1. Variation of orbital period and velocity with distance from the centre of the earth.

It will be observed that one orbit, with a radius of 42,000 km, has a period of exactly 24 hours. A body in such an orbit, if its plane coincided with that of the

Wireless World *October 1945*

Extra-terrestrial Relays—

earth's equator, would revolve with the earth and would thus be stationary above the same spot on the planet. It would remain fixed in the sky of a whole hemisphere and unlike all other heavenly bodies would neither rise nor set. A body in a smaller orbit would revolve more quickly than the earth and so would rise in the west, as indeed happens with the inner moon of Mars.

Using material ferried up by rockets, it would be possible to construct a "space-station" in such an orbit. The station could be provided with living quarters, laboratories and everything needed for the comfort of its crew, who would be relieved and provisioned by a regular rocket service. This project might be undertaken for purely scientific reasons as it would contribute enormously to our knowledge of astronomy, physics and meteorology. A good deal of literature has already been written on the subject.[2]

Although such an undertaking may seem fantastic, it requires

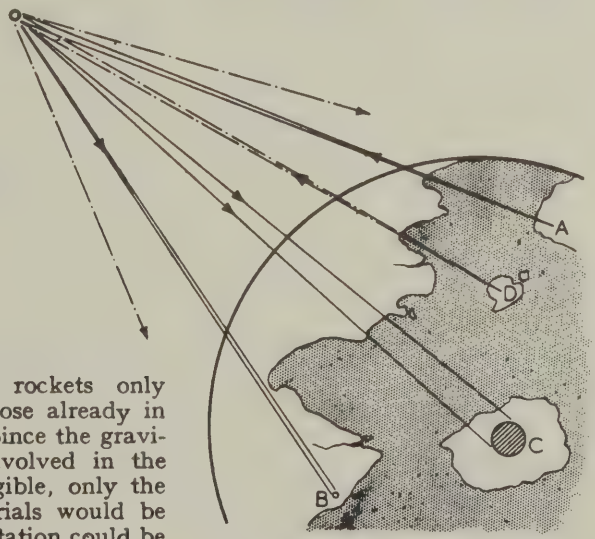


Fig. 2. Typical extra-terrestrial relay services. Transmission from A being relayed to point B and area C; transmission from D being relayed to whole hemisphere.

for its fulfilment rockets only twice as fast as those already in the design stage. Since the gravitational stresses involved in the structure are negligible, only the very lightest materials would be necessary and the station could be as large as required.

Let us now suppose that such a station were built in this orbit. It could be provided with receiving and transmitting equipment (the problem of power will be discussed later) and could act as a repeater to relay transmissions between any two points on the hemisphere beneath, using any frequency which will penetrate the ionosphere. If directive arrays were used, the power requirements would be very small, as direct line of sight transmission would be used. There is the further important point that arrays on the earth, once set up, could remain fixed indefinitely.

Moreover, a transmission received from any point on the hemisphere could be broadcast to the whole of the visible face of the globe, and thus the requirements of all possible services would be met (Fig. 2).

It may be argued that we have as yet no direct evidence of radio waves passing between the surface of the earth and outer space; all we can say with certainty is that the shorter wavelengths are not reflected back to the earth. Direct evidence of field strength above the earth's atmosphere could be obtained by V2 rocket technique, and it is to be hoped that someone will do something about this soon as there must be quite a surplus stock somewhere! Alternatively, given sufficient transmitting power, we might obtain the necessary evidence by exploring for echoes from the moon. In the meantime we have visual evidence that frequencies at the optical end of the spectrum pass through with little absorption except at certain frequencies at which resonance effects occur. Medium high frequencies go through the E layer twice to be reflected from the F layer and echoes have been received from meteors in or above the F layer. It seems fairly certain that frequencies from, say, 50 Mc/s to 100,000 Mc/s could be used without undue absorption in the atmosphere or the ionosphere.

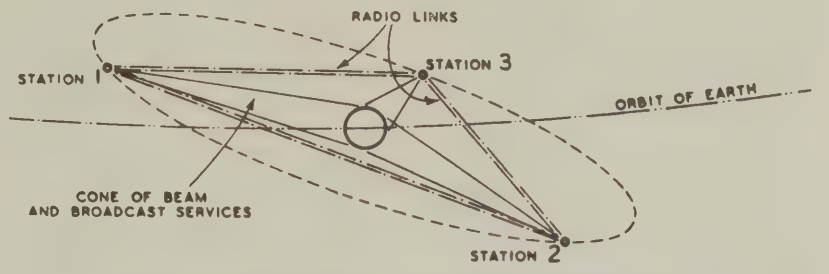


Fig. 3. Three satellite stations would ensure complete coverage of the globe.

A single station could only provide coverage to half the globe, and for a world service three would be required, though more could be readily utilised. Fig. 3 shows the simplest arrangement. The stations would be arranged approximately equidistantly around the earth, and the following longitudes appear to be suitable:—

30 E—Africa and Europe.
150 E—China and Oceana.
90 W—The Americas.

The stations in the chain would be linked by radio or optical beams, and thus any conceivable beam or broadcast service could be provided.

The technical problems involved in the design of such stations are extremely interesting,[3] but only a few can be gone into here. Batteries of parabolic reflectors would be provided, of apertures depending on the frequencies employed. Assuming the use of 3,000 Mc/s waves, mirrors about a metre across would beam almost all the power on to the earth. Larger reflectors could be used to illuminate single countries or regions for the more restricted services, with con-

sequent economy of power. On the higher frequencies it is not difficult to produce beams less than a degree in width, and, as mentioned before, there would be no physical limitations on the size of the mirrors. (From the space station, the disc of the earth would be a little over 17 degrees across). The same mirrors could be used for many different transmissions if precautions were taken to avoid cross modulation.

It is clear from the nature of the system that the power needed will be much less than that required for any other arrangement, since all the energy radiated can be uniformly distributed over the service area, and none is wasted. An approximate estimate of the power required for the broadcast service from a single station can be made as follows:—

The field strength in the equatorial plane of a $\lambda/2$ dipole in free space at a distance of d metres is

$$e = 6.85 \frac{\sqrt{P}}{d} \text{ volts/metre, where}$$

P is the power radiated in watts.

Taking d as 42,000 km (effectively it would be less), we have $P = 37.6\ e^2$ watts. (e now in μV/metre.)

If we assume e to be 50 microvolts/metre, which is the F.C.C. standard for frequency modulation, P will be 94 kW. This is the power required for a single dipole, and not an array which would concentrate all the power on the earth. Such an array would have a gain over a simple dipole of about 80. The power required for the broadcast service would thus be about 1.2 kW.

Ridiculously small though it is, this figure is probably much too generous. Small parabolas about a foot in diameter would be used for receiving at the earth end and would give a very good signal/noise ratio. There would be very little interference, partly because of the frequency used and partly because the mirrors would be pointing towards the sky which could contain no other source of signal. A field strength of 10 microvolts/metre might well be ample, and this would require a transmitter output of only 50 watts.

When it is remembered that these figures relate to the broadcast service, the efficiency of the system will be realised. The point-to-point beam transmissions might need powers of only 10 watts or so. These figures, of course, would need correction for ionospheric and atmospheric absorption, but that would be quite small over most of the band. The slight falling off in field strength due to this cause towards the edge of the service area could be readily corrected by a non-uniform radiator.

The efficiency of the system is strikingly revealed when we consider that the London Television service required about 3 kW average power for an area less than fifty miles in radius.[5]

A second fundamental problem is the provision of electrical energy to run the large number of transmitters required for the different services. In space beyond the atmosphere, a square metre normal to the solar radiation intercepts 1.35 kW of energy.[6] Solar engines have already been devised for terrestrial use and are an economic proposition in tropical countries. They employ mirrors to concentrate sunlight on the boiler of a low-pressure steam engine. Although this arrangement is not very efficient it could be made much more so in space where the operating components are in a vacuum, the radiation is intense and continuous, and the low-temperature end of the cycle could be not far from absolute zero. Thermo-electric and photo-electric developments may make it possible to utilise the solar energy more directly.

Though there is no limit to the size of the mirrors that could be built, one fifty metres in radius would intercept over 10,000 kW and at least a quarter of this energy should be available for use.

The station would be in continuous sunlight except for some weeks around the equinoxes, when it would enter the earth's shadow for a few minutes every day. Fig. 4 shows the state of affairs during the eclipse period. For

A project which goes part of the way towards the goal envisaged in this article has been put forward by Westinghouse in collaboration with the Glen L. Martin Co. of America. The radius of coverage would be increased from 50 to 211 miles by beamed radiation from an aircraft flying at a height of 30,000 ft. and equipped with television and FM transmitters.

Extra-terrestrial Relays—

this calculation, it is legitimate to consider the earth as fixed and the sun as moving round it. The station would graze the earth's shadow at A, on the last day in February. Every day, as it made its diurnal revolution, it would cut more deeply into the shadow, undergoing its period of maximum eclipse on March 21st. on that day it would only be in darkness for 1 hour 9 minutes. From then onwards the period of eclipse would shorten, and after April 11th (B) the station would be in continuous sunlight again until the same thing happened six months later at the autumn equinox, between September 12th and October 14th. The total period of darkness would be about two days per year, and as the longest period of eclipse would be little more than an hour there should be no difficulty in storing enough power for an uninterrupted service.

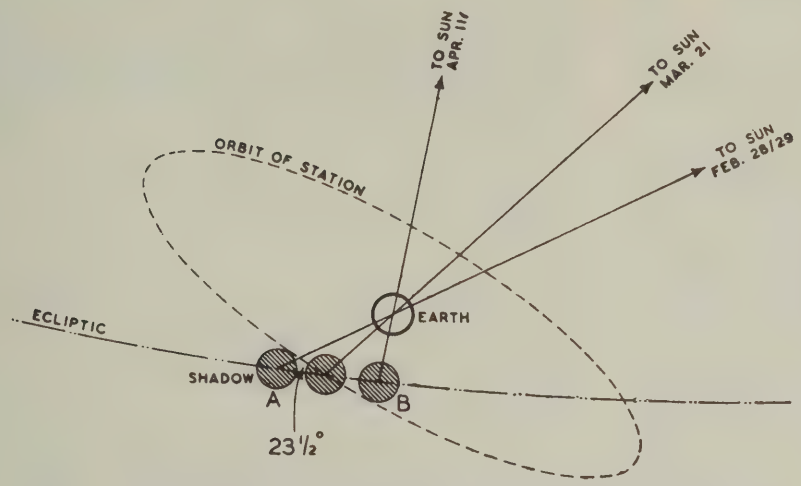


Fig. 4. Solar radiation would be cut off for a short period each day at the equinoxes.

Conclusion

Briefly summarised, the advantages of the space station are as follows:—

(1) It is the only way in which true world coverage can be achieved for all possible types of service.

(2) It permits unrestricted use of a band at least 100,000 Mc/s wide, and with the use of beams an almost unlimited number of channels would be available.

(3) The power requirements are extremely small since the efficiency of "illumination" will be almost 100 per cent. Moreover, the cost of the power would be very low.

(4) However great the initial expense, it would only be a fraction of that required for the world networks replaced, and the running costs would be incomparably less.

Appendix—*Rocket Design*

The development of rockets sufficiently powerful to reach "orbital" and even "escape" velocity is now only a matter of years. The following figures may be of interest in this connection.

The rocket has to acquire a final velocity of 8 km/sec. Allowing 2 km/sec. for navigational corrections and air resistance loss (this is legitimate as all space-rockets will be launched from very high country) gives a total velocity needed of 10 km/sec. The fundamental equation of rocket motion is [2]

$$V = v \log_e R$$

where V is the final velocity of the rocket, v the exhaust velocity and R the ratio of initial mass to final mass (payload plus structure). So far v has been about 2-2.5 km/sec for liquid fuel rockets but new designs and fuels will permit of considerably higher figures. (Oxy-hydrogen fuel has a theoretical exhaust velocity of 5.2 km/sec and more powerful combinations are known.) If we assume v to be 3.3 km/sec, R will be 20 to 1. However, owing to its finite acceleration, the rocket loses velocity as a result of gravitational retardation. If its acceleration (assumed constant) is a metres/sec.^{2}, then the necessary ratio R_g is increased to

$$R_g = R \frac{a + g}{a}$$

For an automatically controlled rocket a would be about $5g$ and so the necessary R would be 37 to 1. Such ratios cannot be realised with a single rocket but can be attained by "step-rockets"[2], while very much higher ratios (up to 1,000 to 1) can be achieved by the principle of "cellular construction"[3].

Epilogue—Atomic Power

The advent of atomic power has at one bound brought space travel half a century nearer. It seems unlikely that we will have to wait as much as twenty years before atomic-powered rockets are developed, and such rockets could reach even the remoter planets with a fantastically small fuel/mass ratio —only a few per cent. The equations developed in the appendix still hold, but v will be increased by a factor of about a thousand.

In view of these facts, it appears hardly worth while to expend much effort on the building of long-distance relay chains. Even the local networks which will soon be under construction may have a working life of only 20-30 years.

References

[1] "Radio-Relay Systems," C. W. Hansell. *Proc. I.R.E.*, Vol 33, March, 1945.
[2] "Rockets," Willy Ley. (Viking Press, N.Y.)
[3] "Das Problem der Befahrung des Weltraums," Hermann Noordung.
[4] "Frequency Modulation," A. Hund. (McGraw Hill.)
[5] "London Television Service," MacNamara and Birkinshaw. *J.I.E.E.*, Dec., 1938.
[5] "The Sun," C. G. Abbot. (Appleton-Century Co.)
[7] *Journal of the British Interplanetary Society*, Jan., 1939.

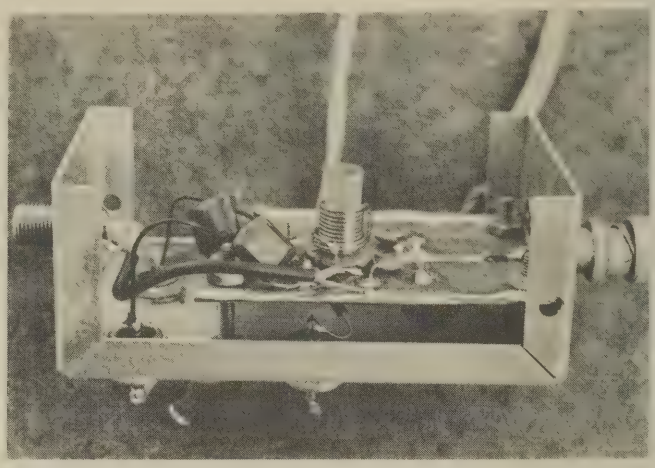
COLEMAN TERMINAL UPDATE

Attendees at SPTS '79 had the opportunity to listen to Robert M. Coleman of South Carolina as he described his work with an active mixer for the front end of a 4 GHz in and 70 MHz out down converter. Coleman's pioneering work in making the surplus work horse TD-2 play for TVRO reception is of course well known. Robert is however painfully aware of the shortage of TD-2 pieces on the marketplace, as well as being concerned that the TD-2 is not state of the art technology anymore.

Pleased with his success with Hewlett Packard series GaAs-FET devices in one and two stages LNAs for TVRO reception, Robert set out to determine just how one could get down to his standard 70 MHz i.f. using a state-of-the-art approach to the now established single conversion system popularized by the TD-2.

One of the first problems tackled, and solved, was a replacement for the LO (local oscillator) which he had originally pressed into service for his TD-2. As difficult as the TD-2 has become to find, the 3.630 to 4.130 GHz range LO source is even more of a problem. In the original Coleman terminal this was a Hewlett Packard TS-403 surplus (CW) signal generator. Not only are signal generators in this range difficult to find, they employ a kylstron tube which at best is apt to be short lived and after failure almost impossible to replace.

ACTIVE MIXER RECEPTION - reception through Robert Coleman's active mixer without LNA in front of down conversion system. See warning about LO re-radiation here.



EARLY ACTIVE MIXER designed and constructed by Coleman housed in Mini-Box. Large coil form is 70 MHz i.f. resonate circuit; 4 GHz input to right, 70 MHz i.f. output to left.

The Coleman solution to this instant problem was to design a very simple LO source around the pre-packaged and ready to operate Avantek VTO 8360. As shown here, the 8360 is ready to mount on a piece of Duroid board; apply +15 volts operating voltage and a (nominally) +10 to +20 VDC (frequency) tuning voltage and you are in business. There is not much to this project; the biggest hurdle is simply coming up with the $125 or so to purchase the 8360! The device should be mounted on Duriod board, the inter-connection cable from the pin 4 LO output should be short and low loss 50 ohm cable (if you could mount the VCO directly to the input connector on the TD-2 you would be even better off by using N to N or BNC to N **adapter** fittings). The tuning voltage should be regulated.

Having easily replaced the TS-403 LO source, the next trick was to look at making the TD-2 mixer a better performing system. The twin diodes used in the TD-2 are several generations 'back' and the performance (i.e. noise figure or conversion loss) of the TD-2 mixer is frightful at best; 12 to 15 dB would not be uncommon.

During SPTS '79 H. Paul Shuch suggested a double-balanced, GaAs-FET mixer scheme; something Paul is reported to be presently working on. The advantages to **a doubly** balanced mixer using **active** devices would be

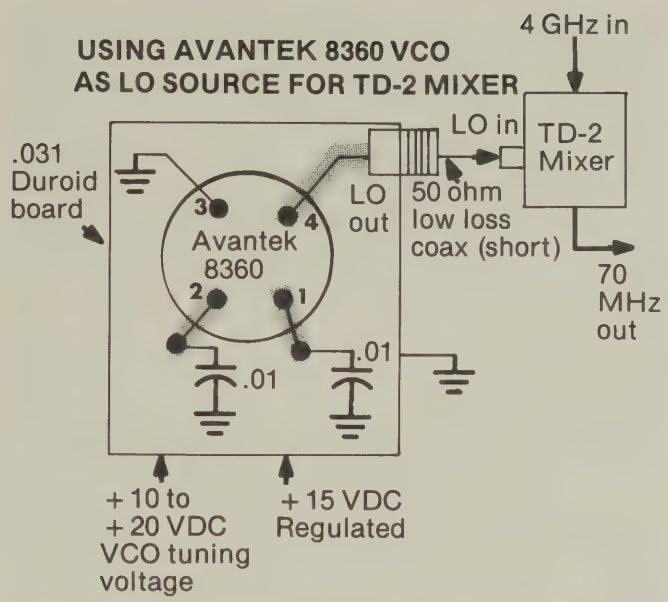
ACTIVE MIXER must be constructed on Duroid board to insure that 4 GHz signals are not eaten up in circuit losses found in normal (lower frequency) circuit board material.

WARNING AND BOARDS

Feeding the Avantek 8360 VTO local oscillator source directly into a mixer which is directly coupled to the feed antenna (i.e. **without** an LNA) is a good way to turn your ten foot dish into an unlicensed transmitting station capable of inflicting serious interference to other 4 GHz receiving systems in the area. A +10 dBm LO source fed back to a 10 foot dish can create an ERP in the 50 to 100 watt region at 4 GHz. **ALWAYS isolate the mixer from the feed with a minimum of one LNA stage and two is even safer.**

Duriod board circuit boards for this active mixer are available from: Robert M. Coleman, RFD 3, Box 58-A, Travelers Rest, S.C. 29690. Price is $25 per board.

USING AVANTEK 8360 VCO AS LO SOURCE FOR TD-2 MIXER



considerable. TD-2 expert Coleman has been working on a similiar scheme but has developed 'interim technology' around a **single** GaAs-FET (HFET 1101) device from Hewlett Packard. In an active mixer, when properly designed and operated, the mixing process becomes part of the positive gain equation; mixing **loss** is replaced by **mixing gain**. This has a dramatic impact on the S to N and C to N equations for a given terminal. By not losing signal in the first conversion, the gain required at 4 GHz is reduced. Noise figure is in theory easier to establish with less expensive devices and fewer of them.

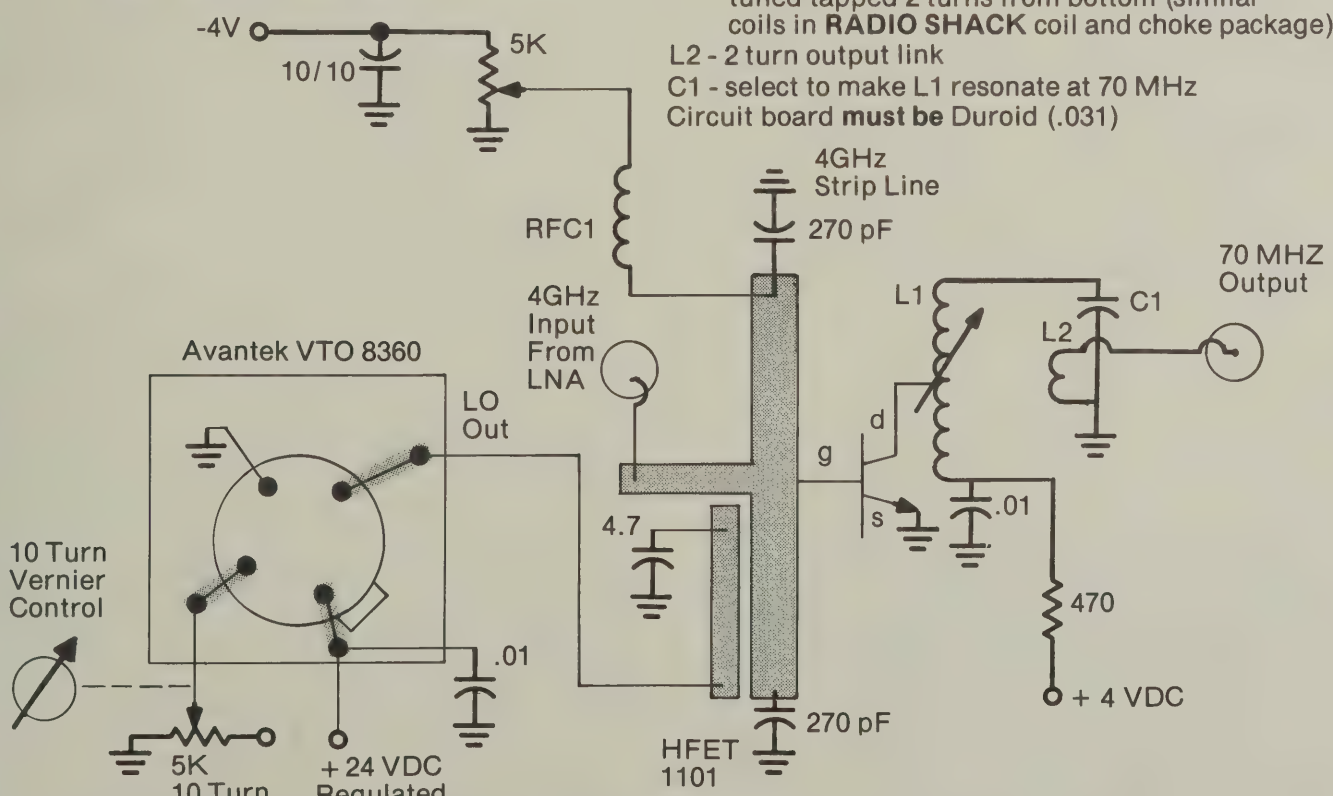
The 'interim GaAs-FET Active Mixer' now in operation at the Coleman terminal is shown here. It employs a single HFET-1101 and the same previously described Avantek 8360 VCO to drive the mixer.

The simplicity of the system is evident in the schematic and circuit layout. Here you are going from GHz down to 70

COMBINING AVANTEK VTO 8360 AND HFET 1101 GaAs-FET FOR TUNEABLE 4 GHz TO 70 MHz DOWN CONVERTER USING ACTIVE MIXER

NOTES:

RFC! - 4 turns # 28 wire, 1/8'' diameter
L1 - 6 turns # 12 wire, 3/8'' diameter slug tuned tapped 2 turns from bottom (similar coils in **RADIO SHACK** coil and choke package)
L2 - 2 turn output link
C1 - select to make L1 resonate at 70 MHz
Circuit board **must be** Duroid (.031)



MHz in two devices and one of those is a tuneable VCO that allows you to tune the full 3.7 to 4.2 GHz band! Note that Duroid board must be used, and that all HFET 1101 capacitors shown are chippers. As shown, the whole package can be placed into a Bud mini-box with ease and can be mounted at the feed of the antenna; piping only 70 MHz i.f. out and down to the balance of the receiver which can be located indoors. The +15 volt operation line, the +10 to +20 (nominal) VTO 8360 tuning voltage can be run back to the feed electronics in suitable weatherproof cable. The +4 and -4 VDC voltages for the HFET-1101 can be shared from the powering that will be in use to fire up the LNA stage(s) ahead of the active mixer. See special note here about using this scheme with**out** an LNA in front of it!

Sources: Avantek VTO 8360 (avantek, 3175 Bowers Ave., Santa Clara, CA 95051); Hewlett Packard HFET-1101 (available through Hallmark Electronics Corp., 1208 Front St., Bldg. K, Raleigh, M.C. 27609 / attention Paul Koeppen); prepared down conversion circuit board (Duroid) from Robert M. Coleman, RFD 3, Box 58-A, Travelers Rest, S.C. 29690.

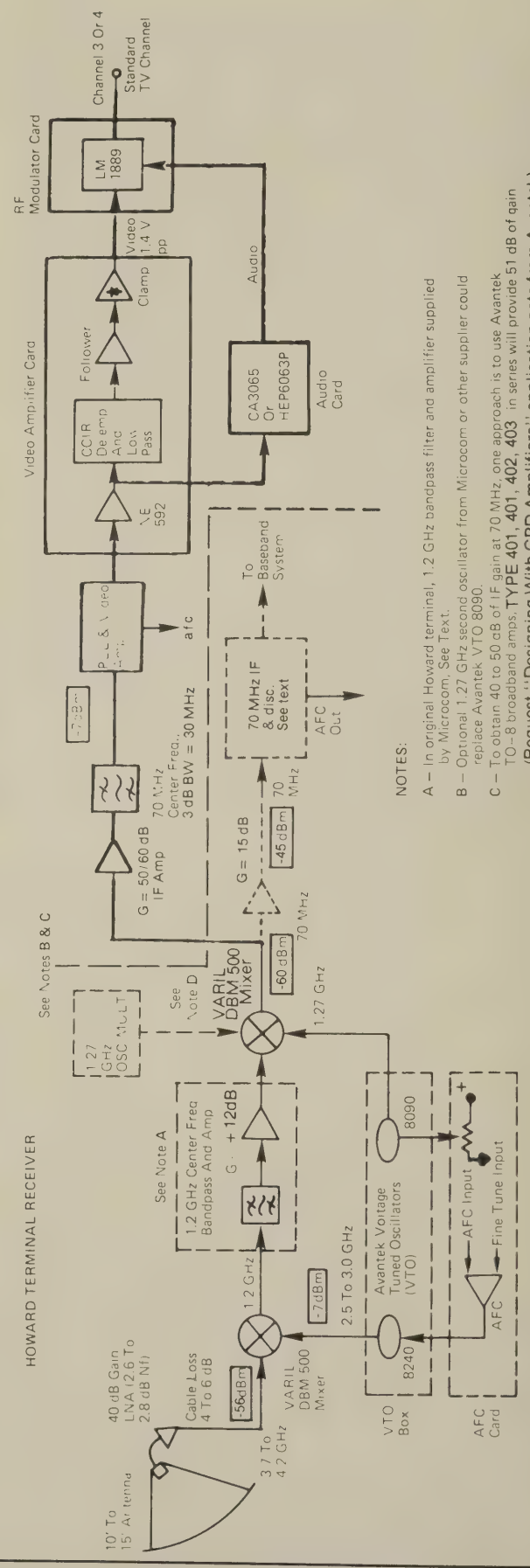
HOWARD TERMINAL UPDATE

If you happened to be one of the first 500 or so to receive your Howard Terminal Manual, you did **not receive** the errata sheet which includes some error-corrections. Most of this information was provided during the Howard Terminal session at SPTS '79 although if you were in attendance it might be a good idea to **re**-check the following against your SPTS '79 acquired corrections.

1) **Page 19** - On the PLL device, **add** a (new) pin 2 between pins 1 and 3, and **add** a 27k resistor from pin 2 to the +12 VDC line (same line as pins 1, 3 and 9 connect to)
2) **Page 21** - AFC card switch SWA (dpdt) should appear as follows, not as drawn:

3) **Page 22** - Middle right and lower right photos are of video modulator, **not** video amplifier as labeled.
4) **Page 23** - 12.1 volt zener (lower right of schematic) should be 12.**0** volt zener (1N5248)
5) **Page 25** - 6.5 Volt zener (lower right of schematic) should should be 6.**8** volt zener such as 1N5235.
6) **Page 29** - total power supply requirements should total 500 mA positive, **not** 380 mA indicated.

Users of the Howard Terminal Manual are encouraged to continue the 'feed back' process by sending questions, corrections, changes or additions to Satellite Television Technology, P.O. Box G, Arcadia, OK 73007.

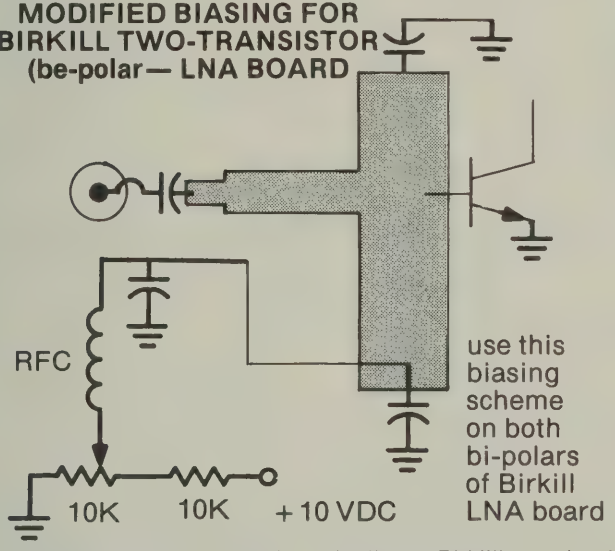

HOWARD TERMINAL RECEIVER
10' To 15' Antenna
40 dB Gain LNA 12.6 To 2.8 dB Nf
Cable Loss 4 To 6 dB
-56dBm
VARIL DBM 500 Mixer
3.7 To 4.2 GHz
2.5 To 3.0 GHz
1.2 GHz
-7dBm
See Note A
1.2 GHz Center Freq Bandpass And Amp
G = +12dB
VTO Box
Avantek Voltage Tuned Oscillators (VTO)
8240
8090
AFC Card
AFC
AFC Input
Fine Tune Input
See Notes B & C
1.27 GHz OSC MULT
See Note D
VARIL DBM 500 Mixer
1.27 GHz
-60 dBm
70 MHz
G = 15 dB
-45 dBm
70 MHz
70 MHz IF & disc. See text
AFC Out
G = 50/60 dB IF Amp
70 MHz Center Freq. 3 dB BW = 30 MHz
afc
To Baseband System
Video Amplifier Card
CCIR De emp And Low Pass
Follower
Video 1.4 V pp
Clamp
NE 592
CA3065 Or HEP6063P
Audio Card
Audio
RF Modulator Card
LM 1889
Channel 3 Or 4
Standard TV Channel
NOTES:
A – In original Howard terminal, 1.2 GHz bandpass filter and amplifier supplied by Microcom, See Text.
B – Optional 1.27 GHz second oscillator from Microcom or other supplier could replace Avantek VTO 8090.
C – To obtain 40 to 50 dB of IF gain at 70 MHz, one approach is to use Avantek TO-8 broadband amps, TYPE 401, 401, 402, 403 in series will provide 51 dB of gain (Request "Designing With GPD Amplifiers" application note from Avantek)
D - Two approaches to 1.2GHz/baseband shown; portion Above dashed represents present and final Howard terminal system.

LNA DESIGN & APPLICATION NOTES

Followers of the LNA progress scene are aware that in the July 1979 issue of CATJ English experimenter Steve Birkhill presented a circuit board layout for a two-stage bi-polar LNA for 3.7 to 4.2 GHz. The same information appears in the appendix section of the **Coleman TD-2 Conversion Manual.**

Several users of the basic Birkhill scheme have reported some instability problems with the bi-polars. Experimenter Robert Coleman has developed a cure for that instability problem; by modifying the biasing arrangement as shown here. The biasing change should be duplicated for **each** of the bi-polar stages and tune-up should follow the guidelines found in the Coleman Manual. The 10K pot is adjusted for optimized performance and this results in a stable operating condition.

MODIFIED BIASING FOR BIRKILL TWO-TRANSISTOR (be-polar— LNA BOARD



Those who have elected to duplicate Birkill's work with the HXTR series of bi-polars should be aware that if you detect an instability problem with the HXTR type amplifier, it will probably cure by changing out the 4.7 pF gate bypass capacitor with a larger value (perhaps as high as 270 pF); chip capacitors of course at this frequency range.

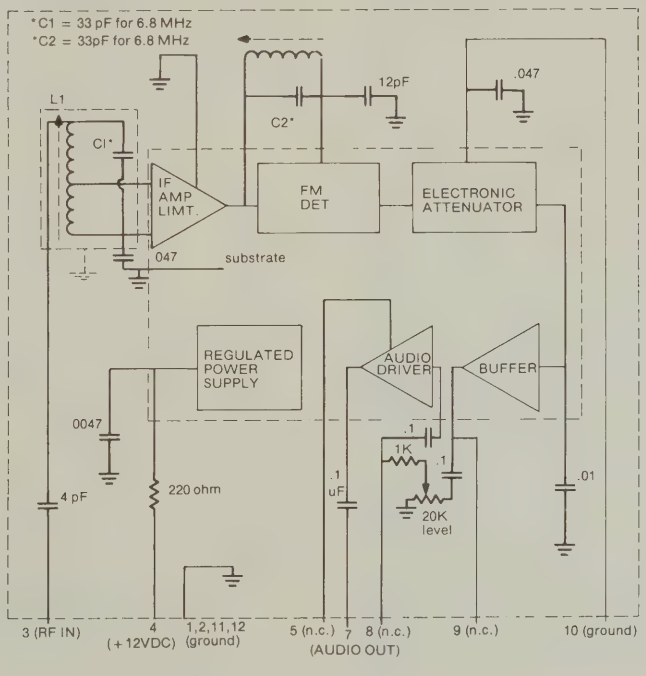
Several experimenters including Taylor Howard have been working with California's DEXCEL to work out a do-it-yourself LNA using DEXCEL GaAs-FET devices. Preliminary indications are that DEXCEL GaAs-FETs will operate in a modified circuit in this application with**out** an isolator (circulator); good news indeed since the cost of the isolator is often higher than the cost of the GaAs-FETs! DEXCEL came away from SPTS '79 apparently convinced that a substantial market for their devices exists in the 3.7 to 4.2 GHz region and we expect to see much more activity from this California supplier in the coming months.

BASEBAND INTERFACING UPDATE

SUBCARRIER AUDIO DETECTOR

John Shelton of Bloomington, Indiana (3521 Stafford Drive, 47401) suggests that the RCA XL-100 television receiver has a **standard module** available on a replacement basis through local RCA distributors which makes a dandy audio subcarrier demodulator for any of the common audio subcarrier frequencies one is likely to find in use in bird circuits.

MODIFIED RCA PM-200 FOR TVRO RECEIVER Sub-carrier Demodulator



The Sound Detection Module **(PM200)** requires only two part changes to take it from the nominal 4.5 MHz i.f. range up to either 6.2 or 6.8 MHz. Parts shown are for the standard 6.8 MHz sound carrier found in most SATCOM activities although slightly larger capacitors at the C1 and C2 locations would allow you to hit 6.2 MHz as well. A really clever person could align a bank of PM-200 modules with suitable switching to allow instant switching over the 5.5 to 7.4 MHz subcarrier ranges employed.

Hats off to John Shelton for discovering this quick and dirty modification to an existing module for ever-easier reception!

TECHNICAL LITERATURE AVAILABLE

MICROCOMM APPLICATION NOTES

A number of ''app-notes'' prepared by H. Paul Shuch of Microcomm (14908 Sandy Lane, San Jose, California 95124) are available. For **each** app note requested send $1.00 (U.S. currency; outside of U.S. send 3 IRC's per app note) **plus** a stamped (15 cents U.S., extra payment outside of U.S.) self addressed envelope.

Title	App-Note #
Solid State Microwave Amplifier Design	1
Cost Effective Modular Downconverter for S-Band WEFAX Reception	2
A Vidiot's Guive to Microwave TV Links	3
Antenna/LNA Tradeoff Analysis for 3.7 to 4.2 (TVRO) video terminals	4
Microstrip - Magical PC Technique Explained	5
Calculating Antenna Bearings for geostationary satellites	6
Calculating Preamplifier Gain from Noise Figure Measurements	7
A Low-Cost Modular Receiver for DOMSAT Video	8
A Low-Cost Microwave Spectrum Analyzer	9
RX-1691 Instruction Manual - complete schematics, installation and application information for S-band Weather Satellite downconverter. Note: Price is $10 in U.S., $12.50 elsewhere.	10
RX-4200 User's Manual - complete schematics, circuit descriptions for Microcomm downconversion module set for 3.7 to 4.2 GHz video (DOMSAT) reception; includes circuit information for compatible baseband processing unit. Note: Price is $25 in U.S., $30 elsewhere.	11

SATELLITE INNOVATIONS

Satellite Innovations (P.O. Box 5673, Winston Salem, N.C. 27103) has a variety of microwave and satellite parts, plans and supplies including chip capacitor kits, feedhorn tubing (2'' diameter), Teflon PC board and various sub-assemblies for a TVRO receiver plus plans for a polar mount and rotating feed horn. Inquire directly.

ROBERT M. COLEMAN

Satellite experimenter Robert M. Coleman has a number of PC boards and chip capacitor kits available for the construction of GaAs-FET LNA stages, bi-polar LNA stages, an active mixer utilizing a GAs-FET device and AVANTEK VCO. For full information contact Robert M. Coleman, RFD 3, Box 58-A, Travelers Rest, S.C. 29690.

MICROWAVE GENERAL

Microwave General (2680 Bayshore Frontage Rd., M.S. 210, Mountain view, Ca. 94043) has a data sheet describing a 10 foot diameter 3.7 to 4.2 GHz reflector equipped with a high efficency Cassegrain feed system which they claim makes the ten foot reflector function with gain equivilent to a full 12 foot parabolic. The antenna is molded, one-piece construction, with a flame sprayed relective surface. Full details are available directly from MG.

INTERNATIONAL CRYSTAL MFG CO.

ICM (10 North Lee, Oklahoma City, OK 73102) has a data sheet describing their newly released TV-4200 satellite receiver; a 24 channel frequency agile double conversion receiver with dual audio outputs for 6.2 and 6.8 MHz. Contact ICM for full details.

AVCOM OF VIRGINIA INC.

AVCOM has a short-form manual that describes their PSR-3 satellite receiver designed for 'low cost reception' of satellite video (and other modulation format) signals. Contact AVCOM at 10139 Apache Road, Richmond, VA 23235.

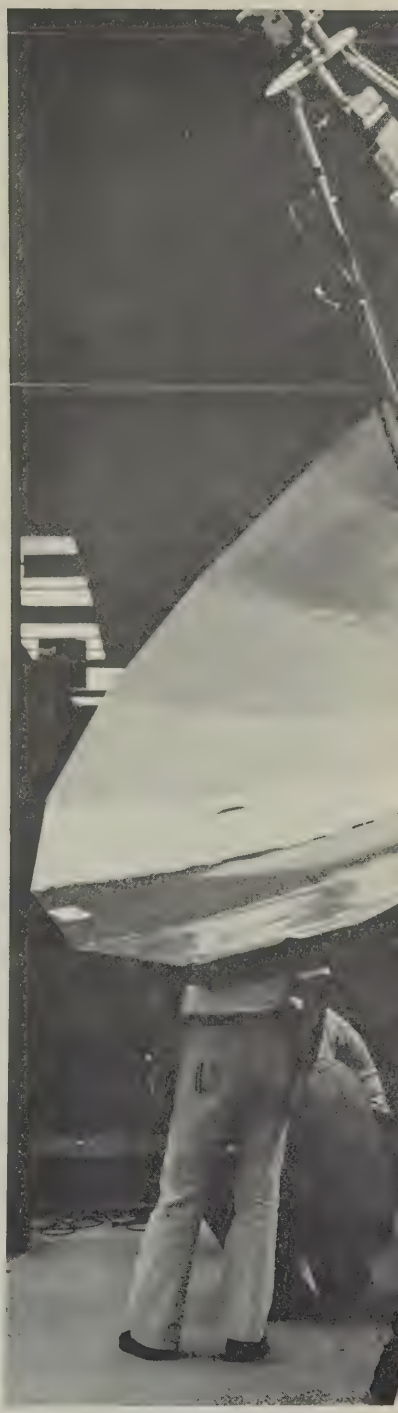
TECHNICAL CORRESPONDENCE AND NOTES

STANDARDS and VERSATILITY

Private satellite terminals are springing up in backyards all across the nation. But before the phenomenom goes to far I suggest we give some thought to making key assemblies in the terminals quickly interchangeable from one terminal to another. By having key terminal components interchangeable it will be far easier to demonstrate and confirm improvements in performance without complex and expensive test set ups, or hastily established hook ups that may themselves degrade the performance beyond the point of meaningful comparisons.

One important area for some 'standardization' is the LNA mounting fixture. It is desireable to have an attachment system that will accept a friend's LNA and vice versa. Being able to quickly swap LNAs will permit fast diagnostic and performance comparisons. Most private terminals have an LNA attached to the feedhorn and they pipe the signal through a length of coax indoors. This configuration has maximum flexibility at a moderate increase in system cost; typically the LNA must have an additional 20 dB or so of gain to make up for coaxial cable losses and this adds the cost of two or so stages of additional bulk gain at 4 GHz to the system. An alternative is to integrate the LNA and the down conversion front end, but to do this may reduce system flexibility (i.e. separating the LNA portion may become significantly more difficult for comparison purposes). If your system does go in this direction, some thought should be given to splitting up the LNA portion from the balance for test and comparison purposes.

PARAFRAME



MOST-ADMIRED AT SPTS '79 was the PARAFRAME ET/3.66 (12-foot) TVRO antenna. Those who saw us go "cherry-picking" on Day Two won't soon forget the fine reception we got from ANIK-B, while using a 150°K LNA. That's big performance and if you were there YOU SAW IT! For reception photos and product information, write or phone "Mr. Paraframe," Jim Vines.

Paraframe, Inc.
1000 Sunset Drive West
P. O. Box 423
Monee, Illinois 60449 **Phone 312/534-7435**

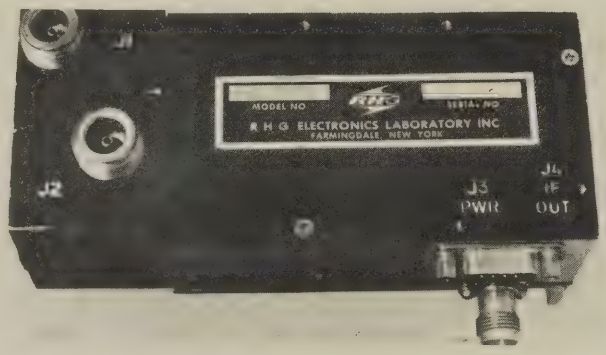
At the SPTS '79 gathering in Oklahoma it would have been instructive to be able to swap various different brands and models of LNAs onto a dish to see first hand how different noise terperatures impacted on the picture quality. Unfortunately since the LNAs all seem to have slightly different configurations, there was no easy way to conduct such tests. At the very least I suggest that we standardize on the size of bracket that the LNA mounts to; such as to a 1 inch pipe. Such a mount would allow the pipe to telescope into a second tube which can then be rotated for polarization switching and the telescoping portion would allow fine tuning of the focus point between different feed horn configurations.

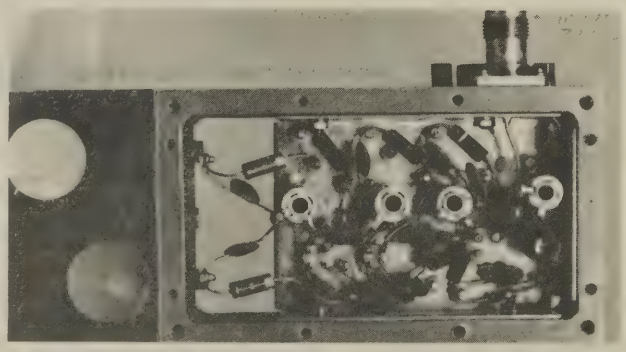
There are many features which will add to the utility and fun of your earth station. As we get further into the exciting field of satellite reception, the importance of exchanging components will increase. Standard mounting techniques and flexible system capabilities will go a long ways in advancing our knowledge and the performance of our individual earth stations.

R. Andrew Hatfield
AVCOM of Virginia, Inc.
Richmond, VA 23235

Andy makes an important point. With several thousand individuals all working on their own 'custom designs' for their own earth terminals we are bound to have several thousand slightly different approaches. This suggests that as an industry group we would do well to start working now, perhaps through a steering committee, to prepare some suggested guidelines for standardization in those areas where standards of design make the most sense. If such a committee got started now, it could have adequate time prior to SPTS '80 number one in Florida (in February or so) to make a set of recommendations and a full report for floor discussion. Who wants to serve on such a committee and what about getting Andy Hatfield to chair it? What do you think??

LOOKING FOR HELP





Your assistance is sought with regard to the attached photographs of a down converter. Is there anyone who might have some knowledge of this device? I am wondering if only the mixer could be used to obtain an i.f. of 450 to 950 MHz for reception of INTELSAT on 3.7 to 4.2 GHz, perhaps using a fixed local oscillator on 3250 MHz. All I know about the unit (an RHG Electronics Lab's MP4 8D80) is that it has a (apparently standard to TVRO) i.f. output of 70 MHz. I have tried to communicate with RHG Electronics but apparently they are no longer in existence.

L. Bruzzichesi
P.O. Box 1
Thyolo, Malawi
(Africa)

Satellite enthusiast Bruzzichesi lives in a portion of Africa where even the most rudimentary of parts are very-very difficult to obtain. Any reader who has schematics, or other helpful information for him would be doing a good turn for international goodwill by writing to him directly. He has been attempting to put together a private TVRO (to receive intelsat) **for more than a year now but progress is very slow. Oh yes, put 86 cents postage on your letter if it weighs less than two ounces!**

MESSY HOWARD BLOCK DIAGRAMS

Yesterday I received the Howard Terminal and the Coleman Terminal manuals from STT. Everything is OK except that page six of the Howard Manual has a block diagram with numbers and letters that are very difficult to read. Will you please send another copy of page six for this manual?

Paul C. Vickberg
Afton, MN 55001

Our printer really did a lousy job on printing some of the Howard Manual page 6's. He's made it good however by printing a new block diagram on a special stickum-backed (peel it off and stick it down) paper stock. If you have this problem with your manual, drop us a note at STT (P.O. Box G, Arcadia, OK 73007) **and we'll get you off a paste-it-down replacement diagram.**

WHAT'S THE BIG DEAL?

I happened to catch the Satellite Magazine program on transponder 21 and I was rather surprised by your enthusiasm over the "low cost" Howard and Coleman terminals. I have been operating a backyard terminal for quite some time now; I go from 4 GHz to the video input of the monitor for less than $100.

I have been very hesitent about publishing any of my work because of the great amount of mail it would generate. My system uses a stressed dish (15') of my own design. The HNA (**high**) noise amplifier is presently a couple of NEC-6435 devices that sell for $17. I am not receiving snowfree pictures but I can tell what is going on.

The weak link in my system is the LNA. The present receiver uses a HP2835 mixer driving a couple of MRF901's into a voltage tuned UHF tuner. This drives a 60 MHz i.f. strip consisting of three MC1350 IC's. The last stage is into full limiting on just noise. The demodulator is the NE-5618 and sound is handled by a CA3089. The LO is a free running MRF-901.

I am curious why Robert Coleman chose the HP GaAs-FET devices since NEC has better devices at a cheaper price. The NEC devices are available off the shelf while the HP devices run 8 weeks.

John Yurek
RD #6, Box 413
Irwin, PA 15642

John apparently does not want letters (he said he was afraid to 'publish' for fear of the mail) **but he writes a pretty good letter himself. Coleman chose the HP devices because he gets off the shelf delivery and they** (meaning HP) **have been very helpful to him in his experiments. Our sources indicate the NEC and HP devices are comparatively priced.**

MOUNTS AVAILABLE

As of this writing we still have some of the polar mounts available that came off of the 10 foot dishes which Stanford had previously used here in the Bay Area for radio astronomy. These mounts weigh about 1500 pounds each, and will give the user complete motor driven control of azimuth and elevation for probably as big a dish as he can find to put on them. They are priced at $450 each, FOB Palo Alto.

Lance Ginner
60 Cody Lane
Los Altos, CA 94022
(408-941-1135)

Anyone looking for a motor driven mount at a reasonable price is urged to contact Lance directly before they are all gone.

VERTICAL BAR INTERFERENCE

Not long ago we ordered a 'Satellite Study Package' from STT and after receiving it and digesting the material we have become interested in the idea of assembling a satellite terminal for use here at Arizona Prison Complex. The idea is off the ground and considering that the spark for the project came from your 'Study Package' we thought you might be interested in the progress we are making. From all of my research, I believe this may be the first such (prison) installation in the country. We do appreciate all of the information you have provided and we are hopeful . . .

Jeff Martin
Admin. Asst. III
P.O. Box 629
Florence, AZ 85232

OK fellas . . . when the copyright and FCC people hang you up because you are watching TV without the necessary agreements and license you can now request that you spend your time at the Arizona Prison Complex in Florence; at least you will not have to go cold turkey on satellite programming while you pay your debt to society!

LOW COST VIDEO MICROWAVE

In attending SPTS '79 we failed to make contact with Bob Richardson, the fellow who is supposed to be the chief designer of low cost multiple channel short haul microwave using the Gunnplexer sets from Microwave Associates. Can you help?

No Name
(which makes it difficult
for us to directly answer!)

Richardson lives at Chautauqua, New York and has an unlisted post office box. His telephone number is 716-753-2654 however. His latest work involves shoving up to five channels of NTSC color video, with accompanying 4.5 MHz offset audio, through a single Gunnplexer transmitter and then recovering the multiple channels of television with a single Gunnplexer receiver that translates directly down to the low band VHF TV channels. In a similar area, a new outfit in Pacheco, California (TCI Corp., 411 N. Buchanan, zip 94553 and telco 415-676-6102) **is now advertising their model TVX10 microwave transceiver which claims to allow transmission and reception of 10 GHz video plus audio for $350 per 'station'. For readers outside of the U.S. and Canada, or where local rules don't prohibit such nonsense, this might make a very good short haul, low cost video plus audio microwave system to tie TVRO reception to neighboring areas.**

DOWN DEEP

I understand most satellite antennas are directed towards the 'mainland' of the U.S.; could you advise me of the expected signal strength here on St.Croix in the U.S. Virgin Islands? Our local PBS station on St. Thomas uses a 30 foot (Collins) dish and the usual mix of expensive equipment. Can I expect to make the grade with a 12 or 16 foot antenna?

Glentronics, Inc.
St. Croix, USVA 00820

The EIRP levels in your part of the Caribbean are in the 27 to 28 dBw region or around 8 to 9 dB below those we play with here in Oklahoma. With a 12 foot dish and a 100 degree LNA you'd have about 5 to 6 dB C to N; a 16 footer would get you up around 7 to 8 dB C to N which is at best impulse noise laden. But it would sure beat watching WSVI or trying to tune in channel 4 from San Juan on the TV and the English sound track on FM!

CIRCUS FOR ADULTS

I wanted to drop you a note and say how much I enjoyed SPTS '79. I'm sure quite a few may have thought about thanking you but are perhaps too caught up in construction efforts right now. I bought Taylor Howard's plans and have constructed my own terminal. Your gathering was just the ticket to get rid of a funny felling ... I'm not the only one who is crazy enough to try it. The informal atmosphere was what I enjoyed most. I came to Oklahoma expecting the usual Hollywood sales hype. Living in southern California does make one gun shy. Instead I was confronted with a new problem ... how would I see and hear everything with so much going on at the same time? Your circus for big kids was great fun and I loved it!

Stephen Gibson
Los Angeles, California 90004

SPTS '79 did have a 'three ring appearance' at times; between the main lecture hall, Paul Shuch's overflow crowd in the ante room and the always bustling exhibit hall area. We'll try to keep the apparently universally appreciated 'informal atmosphere' at SPTS '80 events in the Miami area in February and out at Stanford in June.

MANUAL FEEDBACK

On page 20 of the Coleman manual it mentions an i.f. amplifier available as a CATV antenna mounting pre-amp from Blonder Tongue Labs with a noise figure spec of between 1 and 2 dB. I have a new B-T catalog and the closest thing I can find is a 5.5 to 7 dB low band (VHF TV) unit; their model CMA-LB. Alternately, I did find a Winegard model AC-9260 with 26 dB of gain and a claimed noise figure of 2.2 dB over a 54 to 88 MHz passband. Then in the Howard Manual, page 13, it states that SCI had a price slash and their new prices were $995 for a 150 degree K LNA, and $1095 for their 120 degrees K LNA. At SPTS '79 Tom Humpheries quoted me $1395 for their 120 degree unit and $2800 for a 100 degree unit. I'd also like to note that you provided us with an excellently operated and extremely informative seminar at SPTS '79 and I want to encourage you to continue the fine work you have been doing.

Robert (Bob) Hughes
Cypress, CA 90630

Thank you for the bouquets. Blonder Tongue really ought to be able to do better than 5.5 to 7 dB noise figure in a 54 to 88 MHz antenna mounting pre-amp. Gracious; those are 1950'ish type specs with 6BQ7A type tubes! B-T does have a single channel (CATV grade) **pre-amp which is their SCMA which we have measured against their own lab measurements data sheets in the 1.5 to 2.5 dB region. But this is** single channel **and you really need at least 20 to 30 MHz of i.f. passband centered in your 70 MHz region i.f. output from your mixer to not lose important FM video** (and sub carrier audio) **information. Another possibility is Hansel Mead at the Q-BIT Corporation** (P.O. Box 2208, Melbourne, FL 32901). **Q-BIT**

really makes a better grade VHF pre-amplifier that B-T these days and if Hansel doesn't have a 2 dB or better noise figure across 54 to 88 MHz available, we suspect he would make you up one in fairly short order. Winegard products through the years have been good workhorses and reliable but they sometime get abit spec happy in their data sheets. Still, a claimed **noise figure of 2.2 dB is hardly that out of line with the real world so perhaps the AC-9260 is the answer. Winegard prices are usually fair, and the line is well stocked at wholesale houses that cater to TV shop people. As for Tom Humpheries and his apparent rubber pricing sheet; we kind of understand Tom's dilemma. In the CATV marketplace competition has forced LNA prices down** (down, down). **Tom reacted by staging a 'summer sale' for LNAs and the SCI receivers, making a mailing to the full cable industry. He also mailed brochures to several thousand 'private terminal enthusiasts'. In these mailings SCI extended their 'installing distributor price' to anyone who sent cash with order by a July 31st cut off date. Their installing distributors, meanwhile, took note of this and raised bloody hell with Tom. The Howard manual noted the 'summer sale' price discount, but by the time we got to SPTS '79 in mid- August the sale was over. Not anxious to lose the 'installing distributor' business, Tom held the line on the July 31st cut off date and thus the price-rise from the Howard Manual quoted pricing. Our feeling is that wherever the current LNA pricing rests, it is but a temporary plateau. Over the next year LNAs will continue to drop.**

FAR OUT

I am wondering how to use microwave technology to capture gamma rays or neutrinos. Please do not laugh. For the past few years I have been studying astronomy; my reason is this. I am hooked on solar energy and I am trying to combine astronomy and radio.

The solar collector on the roof or southern exposure of a building is sized in proportion to the square footage of the floor space to be heated. The larger the building to be heated, the more solar collector required. What occurs to me is that there ought to be some way to 'tune' (as in RF circuit tuning) the heat rays or the light rays to a solar collector. Recall if you will that radios at one time were monstrous affairs sitting on the floor; now they fit into the palm of your hand. Is not the same size reduction possible with solar collectors?

If rays can be tuned, why not at night or even on cloudy days? Right now I am using aluminum gutter aprons (two L sections form a rectangle and then a stack of rectangles form a series of parallel U sections) to attempt to **tune** the heat rays. Yes, I know that heat rays are like a billionth of an inch. That is the challenge. Is there anyone out there who can help me with this project?

N. D. Perlman
4420 N. Sacramento Ave.
Chicago, IL 60625

There we have the Science Fair project of the month fellows.

FOR YOUR EARTH STATION, CHOOSE

AVCOM'S PSR-3

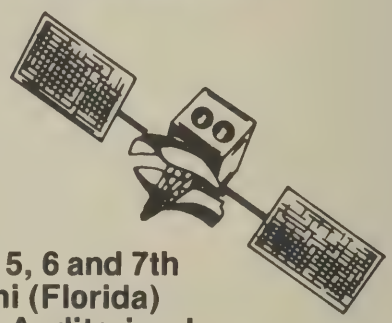
SATELLITE VIDEO RECEIVER

DESIGNED FOR YOUR PRIVATE TERMINAL

- Remote tuning
- Dual video outputs
- Exclusive Clamp-Sync & Scan-Tune
- Many other features!

AVCOM of Virginia, Inc.
10139 Apache Road, Richmond, VA 23235
(804)320-4439

SPTS 80 MIAMI



FEBRUARY 5, 6 and 7th at the Miami (Florida) Bayfront Park Auditorium!

MORE THAN 25 SEMINAR SESSIONS jammed into three activity packed days. H. Paul Shuch, Taylor Howard, Oliver Swan, Robert Coleman and nearly a dozen other 'satellite-innovators' will teach the latest in low-cost satellite TV technology.

SPECIAL SESSIONS AIMED AT MARKETING the satellite TV service to rural residents of North, Central and South America. A special session devoted to reception techniques required in the far eastern caribbean, and Central America; a separate session (in Spanish!) to teach reception techniques and requirements in northern South America!

SPTS '79 WAS A SELL OUT. Registration forms are now available for SPTS '80/Miami. Each registrant will have the option of receiving the Howard, Coleman and Swan TVRO system manuals as a part of his registration package. Come to SPTS '80/Miami and learn all about the low-cost satellite TV revolution, what it means, and how to be a part of it. Call or write for your registration forms now ... don't be left out when SPTS '80 fills up!

SPTS '80 / MIAMI

Write: SPTS '80/Miami
P. O. Box G
Arcadia, Ok. 73007

Call: Satellite Television Technology
(405) 396-2574 between 9 AM and
4 PM central time weekdays.

TECHNICAL NEWS NOTES

SATELLITE 'Ham' NET

Meets Sunday at 1800 zulu on 14.303 **or** 14.311 (latter frequency used when 14.302 is busy with Caribbean hurricane net traffic). Net control is either W5KHT or W5JG. Typical check-ins include K4AWB (Robert Coleman) for those working on Coleman TD-2 conversion system. Will move to 1900 Z when daylight time ceases.

SATCOM FII SAGA CONTINUES

The checkered history of RCA's SATCOM FII bird added yet another chapter on September 13th (a Thursday) when RCA reportedly 'lost control' of the bird around 6 AM eastern time. Apparently RCA's ground control people detected a stabilizer control deviation and in attempting to correct for the error the bird decided to 'flip'. Thus abruptly cut off all downlink communications including the multiple-transponder feeds directed at Alaska (RCA ALASKOM is primary supplier of inter-state communications in and out of Alaska for the state and FII is the bird for this purpose). RCA promptly began pulling important Alaskan traffic off of FII and re-routed it through SATCOM FI; the usual cable TV bird'. Transponders 3, 7, 9, and 21 were impacted by the 'yank and replace' activity with 21 down and gone from regular CATV service most of that day. By late on the 13th RCA had regained control of FII and cable service channels were normal on the 14th.

SATCOM FII has been a 'difficult bird' since launch. It lost one transponder during or immediately after launch, and during the launch phase a cable that helps hold and guide the solar panel array broke or snagged. For the full life of the bird since the launch the ground control operators have had to 'hand crank' the solar panel backwards around a dead spot or high friction zone every day as part of normal operations. At various times other transponders have acted up on the bird and RCA's concern about the long term health of FII may have played a part in moving all of the cable traffic (which was on FII until June 1st of 1978) over to FI.

Had RCA totally lost FII, they have a backup agreement with the Canadian TELESAT group that operates ANIK whereby up to 11 channels of SATCOM traffic could be moved to one of the ANIK birds for emergency service restoration. However the health of the ANIK birds involved (I and III) is not good and until RCA has FIII in orbit and operational early in 1980 there are many very nervous people depending on the continuation of the existing services.

NETWORK use of satellites continues in study phase. NBC first asked WU, COMSTAR and RCA for proposals last spring; since joined by ABC. First responses are due back this month. Nobody's doing much talking but apparently most serious plan calls for east coast feed of programs to central time zone and west coast feed to mountain time zone to allow stations in both zones to re-adjust their programming hours to eastern/pacific release times. Both central and mountain now release an hour earlier than the coasts, local time. This one is likely to drag out several years.

SMART package offered by RCA to broadcasters at NAB meeting in Dallas this spring seems to be running backwards. RCA said total of 'more than 200 stations' indicated they would accept 'free earth terminals' from RCA/SATCOM but many reportedly have had second thoughts since RCA would dictate where terminal antennas would point and when/where they could be used. In interim several group broadcasters have committed for their own terminals which almost without exception are 'steerable antenna' versions since broadcasters see ability to change satellites very important to their use of birds. One version available guarantees to go from bird to bird in ten seconds time!

JOHN BLAIR and Company, a commercial oriented firm doing business nationwide, has finished test of sending commercials via satellite. This has implications for stations considering RCA SMART package since RCA had hoped that two types of customers would line up to pump video/audio to TV stations equipped with SMART gear; one of those being advertisers and agencies. Blair feels that satellite is economical way to send out first gerenation dubs of commercials to broadcasters, is looking at establishing receive terminals in largest 50 market centers in U.S. before end of 1980. Blair will deal with stations that already have terminals to represent them in some markets, encourage stations to install terminals in others, may even put in terminals themselves in remainder. Back to back commercials may therefore be expected in some time slots on some transponders by spring of 1980.

U. S. CHAMBER of Commerce is latest to announce it is investigating using satellites to distribute TV programming. Chamber has new TV production center in Washington, considers TV high class way to get message across, would offer programs directly to stations via satellite.

COMSAT announcement in mid-summer that it would like to provide up to six channels of 'subscription television service' via satellite, for North American viewers, still has industry buzzing. COMSAT proposal is just that ... a 1982-83 time frame **plan** for between $15 and $25 a month they would distribute programming via 12 GHz satellite to anyone who wanted to 'subscribe'. System would be 'secured' with uplink commands sent via satellite to individual subscriber terminals; those terminals not receiving proper coded message would simply not produce video/audio outputs. Every terminal would have its own decoder and every decoder would have custom one-of-a-kind decoding sequence. Anyone who did not pay for a specific program, channel, or was late with payment would be 'missed' in data burst sent out every ten minutes via satellite to turn receive systems on and off. Like some pay cable security systems, the terminal would function fulltime but nothing 'intelligent' would appear **at output** unless coded signal for that terminal was received to 'switch on' the terminal output. COMSAT is running into considerable pressure from U. S. broadcasters with proposal but has now briefed White House telecommunications personnel on system and is holding preliminary talks with massive entertainment programming distributors such as MCA. **RCA** mystery over who will be up on FIII, and where, continues. When RCA launches FIII in November/December, and then goes through 90 day bird-orientation and check our period, all existing FI cable services

are supposed to switch over to FIII (to be at 132 degrees west). Only RCA indicates that perhaps **some** of the existing services now on FI **will not move**; they'll be left behind on FI. RCA says they have all 24 of the FIII transponders sold and they have been quoted as saying an additional "13 cable programmers are in line" for the transponders on FI after the move. Cable programmers feel that they have to be an FIII with HBO and WTBS and the other biggies or they may lose shot at being carried by many cable systems that will not install a second dish for second bird. SIN (Spanish International Network) has filed against RCA claiming they will be one of those left behind; rumors (and we label them as such) suggest WOR may be another one left on FI. RCA has always been very careful about keeping a tight rein on information of this sort, and they have also been good at seeing that when a move of this sort occurs that they 'arrange' transponder users so that there is something worthwhile on each bird/polarization. Same thing happened when initial cable users were on horizontal and RCA moved to vertical for expansion channels a year ago. Nobody wanted to be on vertical fearing that cable firms would not spend extra money to have vertical capability. That proved a needless worry but cost of setting up for two birds is far greater than cost of setting up for two polarizations (the Swan Spherical antenna excluded!).

SIN'S GALA-VISION, meanwhile, may or maynot start off on October 26th announced date. GALA-VISION is 72 hour per week Spanish language pay cable program feed for premium service sale; movies, novellas (continuing soap-operas), sports and other features of interest to Spanish speaking peoples. Service had planned to sublet transponder 18 from Reuters for late October start.

FATE of transponder 1 on FI remains another question. Way back when, Southern Satellite Systems announced they would bring Oakland/San Francisco KTVU up on FI. However before KTVU began service SSS sold 80% of that operation to Holiday Inns of America and they finally brought it up as SCS. Holiday Inns subsequently decided it only wanted to be a customer of satellite services, not an operator, and thus in August they sold SCS to Warner Communications. Warner operates Nickelodeon on FI transponder 11 and STAR CHANNEL on 5 and 11. Officially, Warner is saying they are going to leave KTVU up on FI. Unofficially, cable industry is abuzz with rumors to the contrary. One oft repeated suggests that Warner will take off KTVU sometime after first of 1980, and sub-let transponder 1 to Washington-Post operation for a full time news format service similar to that now being readied by Ted Turner. Cable acceptance of KTVU has been dis-appointment to everyone; service in **probably** losing money so if that continues chances are KTVU's days are numbered. Only real question is what will replace it. And when.

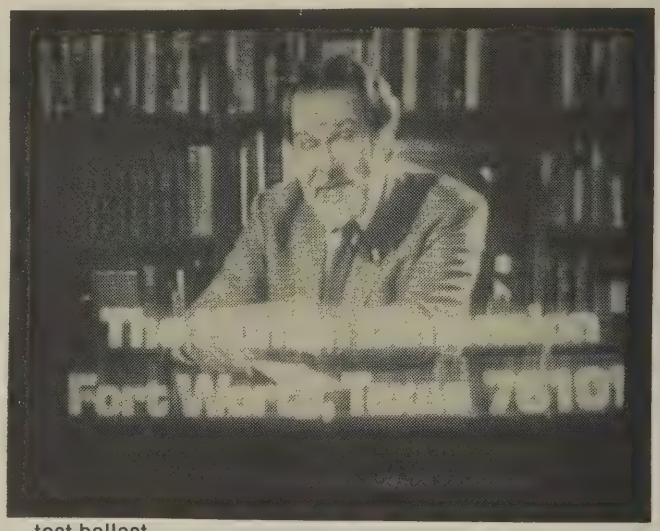
SHUTTLE SCHEDULE keeps getting set back and with set backs come more and more delays for international space programs depending on shuttle to get birds into orbit. Latest schedule (which officials agree may still be optimistic) is as follows:

JUNE 1980 - test instruments
NOVEMBER 1980 - OSIA-1 Earth Station (pallet)
June 1980 - test instruments
November 1980 - OSIA-1 Earth Station (pallet)
February 1981 - PDRS Test
May 1981 - SSUA-A verification
September 1981 - TDRS-A (Western Union and NASA)
October 1981 - ANIK C1, INTELSAT V-5, SBS-1

Thus we are precisely two years away this month from current 'optimistic' projected first-use of Shuttle for launching communication satellites (everything prior is of a test nature).

ARIANE launch system meanwhile seems to be cutting their projected operational date shorter. Ariane is African based semi-private funded rocket launch system developed largely by german engineering and money and it is competitively in market looking for launch customers. Latest Ariane launch schedule is as follows:

November 1979 (LO1) - Test module and ballast
March 1980 - AMSAT Germany (amateur package) plus test ballast
June 1980 - APPLE (Indian), Meteosat, and test modules
October 1980 - MARECS-C, and test modules



SPACE communication systems planning seems to be popular way to spend paperwork money these days. President Carter is asking Congress to re-address existing laws so that progress in space communications 'not be impeded by out of date laws'. Specifically, he wants 1) fully competitive marketplace by deregulating where regulations inhibit competition, and 2) review and tossing out of old laws that were borne under older technologies. Group called Consumer Federal of America meanwhile has asked President Carter to creat a non-commercial satellite system for U.S.. They want FCC to extablised much-reduced satellite use tariffs for non-profit users and are also asking for a 'national commission' to create a study of the potentials of low cost direct to home broadcasting. They could save a bundle by simply attending the Miami area SPTS in February!

BROADCASTERS are continuing to jump on satellite bandwagon although 'typical' broadcast station installation is in the $100,000 region. Installations typically use ten meter steerable (remote, motor controlled) dishes, redundant LNAs, multiple receivers. Multiple broadcast station owner Storer Broadcasting latest to commit; seven big terminals in all.

JAPANESE NEC says it will produce 12 GHz receive only terminals in quantity but it will not enter 4 GHz market. NEC quotes pricing such as $500 per terminal for 0.4 meter dish and electronics (LNA, receiver) in 10,000 per annum run or $350 for 100,000 per year manufacture. They claim tests of 0.4 meter system in Japan shows 46 dB (video) signal to noise ratio with operational (and experimental) BSE satellite there.

UPI's slow-scan video plus accompanying audio, currently carried on two sub-carriers on SATCOM FI transponder 6, will combine both sets of data on a single subcarrier around November 15th (may slip because of hardware delivery problems). Presently using 6.2 and 7.4 MHz subs, apparently only 6.2 will be used after switch. UPI's system currently has around 140 CATV system users reaching some 700,000 U.S. homes. Charges are 5 cents per home per month ... but, $100 per month minimum.

SPTS '80 set for February 5, 6, and 7 at Bayfront Park Auditorium, Miami, Florida. Three day event (Tuesday, Wednesday, Thursday will be in popular downtown Miami water front area and will include extensive technical seminar program patterned after highly successful SPTS 79 held in Oklahoma city last August. Oklahoma City event was a sell out with 506 attendees enrolled; Miami facility can handle up to 1,500 people with separate room for H. Paul Shuch lectures (seating 350 people), main lecture hall, and space for exhibits. Even with increased capacity, STT expects SPTS '80/Miami to be a complete sell out and anticipates large contingent of delegates from Caribbean, Central and South America.

COOP'S COMMENT ON PROGRAMMING

FCC DEREGULATION AND PERMISSION

Elsewhere in this premiere issue of CSD there appears a detailed report on the status of satellite programmers; who you can and cannot 'deal with' to acquire the legal right to view certain satellite delivered programming. The bottom line is that no fewer than five channels are today either totally free of charges, or they have a one time charge of no consequence. Throughout this issue there are words about the expected deregulation of television receive only (TVRO) terminal deregulation at the FCC. A few words more, here, will I hope cement that issue.

The FCC wants to be out of the TVRO licensing business. Some FCC attornies believe the Commission was on dangerously thin ice when in the first case it told the cable industry some four years ago that they had to get FCC approved licenses for their terminals before they could build same. Those of us who remember 1975 FCC licensing standards would be the first to point out that today's FCC licensing process, as burdensome and valueless as it may be, is a piece of cake when compared to the 1975 requirements. The FCC is not alone in wanting to be out of this needless requirement; the Department of Justice and other usually persausive federal power groups are of a like mind. Several influential Congressman, including Representative Lionel VanDeerlin of California (who heads the House Sub-Committee on Communications) are in favor of deregulation.

Many special interest groups want the licensing to stay. The broadcasters are one; without licensing, broadcasters see a proliferation of private TVROs. Some of the cable programmers are another; without licensing, they hope to salvage at least a federal 'registration requirement' in hopes that if most private terminal people register the terminals as the rules would require, at least they'd have a starting place to begin their search for illegal viewing. Some firms who have made a considerable bunch of money processing FCC license applications (at $1000 and up a pop) also want things left alone.

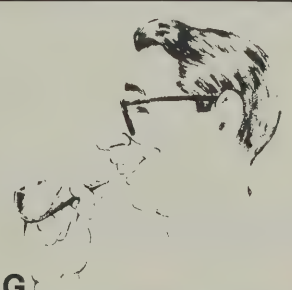
If indeed the Department of Justice is correct, and the FCC is 'out of bounds' with their licensing requirement, then nearly 2,000 cable systems have blown more than $2,000,000 in going through a licensing process that was in itself illegal. But far worse than that, many major projects that would have gotten off the ground a year or two ago have also been axed because of the illegal licensing requirement. The Mutual Radio Broadcasting Network, for example, announced more that 20 months ago that it was ready to install over 500 ARO (audio receive only) terminals using ten foot dishes for a national radio network link system. The FCC beat them back by waiving the 'rules' at them. The rules state that no terminals of less that 4.5 meters in size will be licensed; without rule waivers. Several other major audio networks have been iced while this is sorted out. Even worse yet, the Naitonal Public Radio Network (NPR) went ahead with an estimated 150 4.5 meter audio only terminals for their WESTAR feeds at costs that are 50% or more higher per terminal than they should have been had they been 3 meter AROs. Buying an extra 1.5 meters of antenna drove the price up 40%; going through the needless licensing process added another 10% to the costs. NPR went ahead and paid the price ... because NPR gets its money from federal and state or local fund grants. In short, tax money largely paid for the terminals and the attitude was ''full steam ahead, hang the price''.

The latest word as we go to press is that the FCC will 'consider' deregulation of both TVRO terminal licensing and at the same time dis-mantling the technical restrictions that presently mandate 4.5 meter or larger (commercial as opposed to private) installations in their October 10th session. Not to worry, it may well be put off another week or two not because of the weight of lobbying pressure against the deregulaton, but simply because of the press of 'other business' at the FCC. My sources say that the FCC will assuredly do away with mandatory licensing; they may even do away with a followup 'registration process'. If that comes to be, installing TVRO (or ARO) will be as complex as unpacking a TV set and hooking it up; **no paperwork at all.**

When (no if) this happens, we move to square two in this complicated maturing of a new industry and television delivery service. Being free of FCC licensing is important. It will add a tremendous amount to the foundation we are all trying to build upon. Watching TV is un-nerving enough without having to post guards out front to warn of the approach of 'revenue agents'. Having a clear cut, legal right to **own** satellite TV receiving equipment with**out** a license will bring dozens of new hardware manufacturers into the field. Rapidly. It provides the foundation of legitimate operation which missing to date has scared many reputable but capable firms away.

The next phase of maturing is to get the satellite programmers to recognize that this market is different than the cable market. That by working with the market, not hiding from it, there is money to be made here at the programming level. It is a complex problem that will require possibly years to resolve, but it can be done. There is no better time to start the project than now, coinciding with the deregulation of the licensing portion of the equation. Viewers and would be viewers need to urge the programmers to cooperate; programmers need to be looking for ways to resolve the conflicts forced upon them by narrow minded copyright interests. Working together, the sky is the limit.

CSD



PROGRAMMING

COOP'S SATELLITE DIGEST (Programming Edition) is produced monthly by Satellite Television Technology, P.O. Box G, Arcadia, Oklahoma 73007 (405-396-2574). CSD is available in two separate editions (Programming and Technology) or as a combined subscription. Subscription rates are $30 per year for first class mail delivery within U.S.A. or Canada for either edition, or $50 per year for the combined editions. Outside U.S.A. or Canada add $25.00 per year for any subscription. All subscriptions to be paid in advance in U.S. funds drawn on a U.S. bank; no invoicing.
Contents are Copyright 1979 © by Satellite Television Technolgy and any duplication or reproduction in any form without written permission is a violation of Federal Statue (17 USC 101 et seq.).

SPTS '79 REPORT

SPTS '79 is history. It was quite a gathering and the 506 official registrants who jammed themselves into a facility designed to hold 60% of their number went home largely satisfied with the program, the information they were exposed to, and fired up with the excitement that can only come from being a part of a major new pioneering effort.

SPTS '79 provided many answers and left many questions unanswered. As Stanford's Taylor Howard so properly phrased on the podium, "...**engineers do things because they are engineers and because their engineering virility is challenged. Sometimes however engineers do things that the social and political factions are not ready to accept**". At SPTS '79 it was plainly evident that engineers had indeed been doing their thing, and would indeed continue doing their thing. The challenges presented by the turn-on of the satellite television (and indeed, satellite communications) revolution are obviously not beyond the ability of the various engineers and engineering firms working on the problems. What may be beyond the scope of simple accomplishment is how the extablished agencies, service firms and entrepreneurs affected (perhaps adversely) by the explosive satellite technology are going to react, deal, and eventually accept the wonders being wrought by the engineering types.

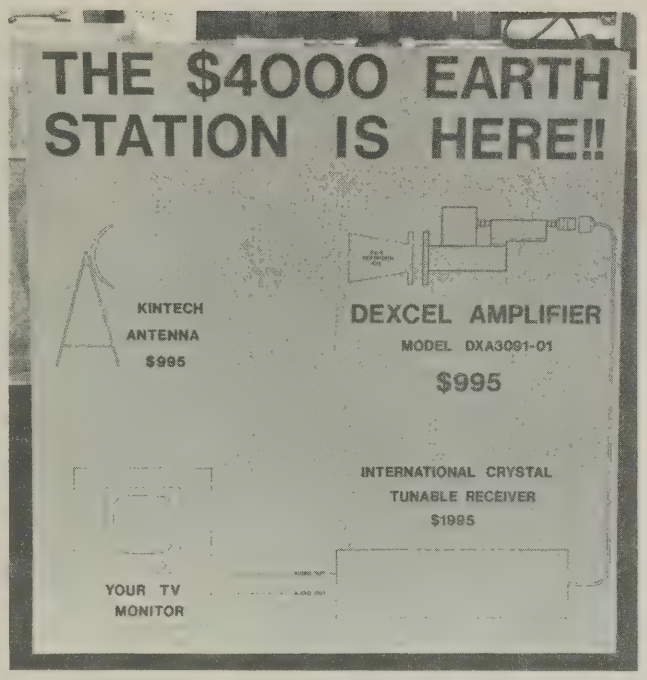
International Crystal Manufacturing Company (10 North Lee, Oklahoma City, OK 73102), hereinafter ICM, was the first to introduce an 'under $2,000' 24 channel frequency agile receiver. The ICM satellite receiver covers the full band from 3.7 to 4.2 GHz, has

PORTIONS OF FOUR - of the five antennas installed and operational. Far right is the DALSAT 3 meter (ten food) brought along for Gardiner/Starscan and SCI booths. A portion of the PARAFRAME behind the DALSAT 3 meter. KINTECH 12 foot kit in center and the screenmesh reflector surfaced USTC on trailer to left. Second USTC (fiberglass) is out of camera range to left.

dual (6.2 and 6.8 MHz) audio baseband outputs, a built-in LNA power supply and a 12 position step tuning switch that is augmented with a fine tuning control. ICM's Royden Freeland has been working on this project for more than a year, ever since he came out to Coop's Lab and saw the operation on the Lab's twenty foot monster antenna. Inside the ICM receiver one finds a generous helping of H. Paul Shuch (Microcomm) modules that gets the 4 GHz received signal down to the final 70 MHz i.f. (through a dual conversion scheme). The ICM receiver initial supply that appeared at SPTS '79 was sold out on the floor before the Seminar was finished.

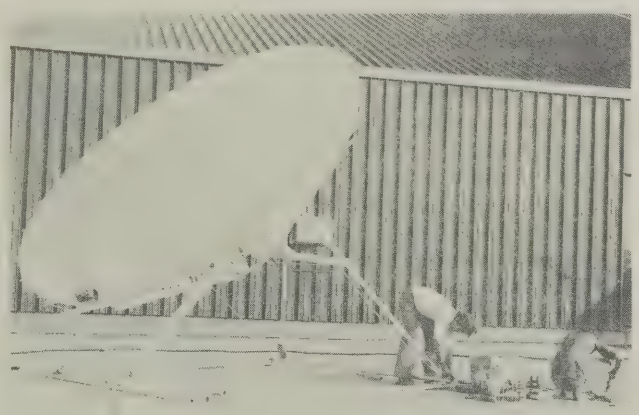
The appearance of the ICM receiver sparked the co-appearance of a pair of billboard signs which proclaimed "the $4,000 earth station is here". Interpretation? If you take the ICM receiver, a DEXCEL 30 dB gain 150 degree K LNA plus a KINTECH Technology 12 foot assemble-it-yourself antenna kit, you have a complete station (less the cables and minor bits and pieces) for $3,900. Alas, a couple of flies flew into the mixture **after** SPTS. John Kinik, who labored very long and very hard to get his 12 foot antenna out of its packing crate and together (ably assisted by several volunter SPTS attendees) for demonstration purposes returned to California unsure whether or not he **really wanted** to be producing 12 foot (or any size of) 'kitable antennas'. At last word John was toying with the idea of **not** producing antenna kits but rather producing and selling a detailed set of instructions telling others how to buy in their local areas common (Reynolds, etc.) alumium extrusions and sawing and hacking and drilling their way to their own self-constructed and self-assembled 12 foot parabolic.

Another new receiver, seen for the first time at SPTS, and showing considerable promise was the PSR-3 Satellite Video Receiver from **AVCOM Satellite Systems Division** (10139 Apache Rd., Richmond, VA 23235). AVCOM's Andy Hatfield, like ICM's Freeland, got started with a private terminal experimental installation about a year ago. As an accomplished RF engineer Andy took a long and hard look at the then existing 24 channel tuneable receivers and decided that he could do it as well (or better) for far less money. The PSR-3 is a double conversion receiver with a first i.f. at 880 MHz and a second i.f. at the more or less standard 70 MHz. One of the many sleight-of-hand tricks build into the PSR-3 is the tuning mechanism; a dial that looks strangely like a voltage meter and a single knob (pot) control. A table on the receiver front panel tells you what voltage to dial up on the meter face with the single tuning knob to produce the transponder you are interested in. Another interesting wrinkle is a optional subcarrier demodulator that gives you an output that will feed directly into a standard FM tuner or receiver. In this way the new (NPR) stereocasts on WESTAR can be dialed up and enjoyed in stereo. Yet another feature is an automatic scanning system that electronically tunes the satellite receiver through the 3.7 to 4.2 GHz frequency range at an adjustable rate. As Hatfield points out, this feature should prove especially helpful in both demonstrating the satellite service and initial antenna alignment tests.

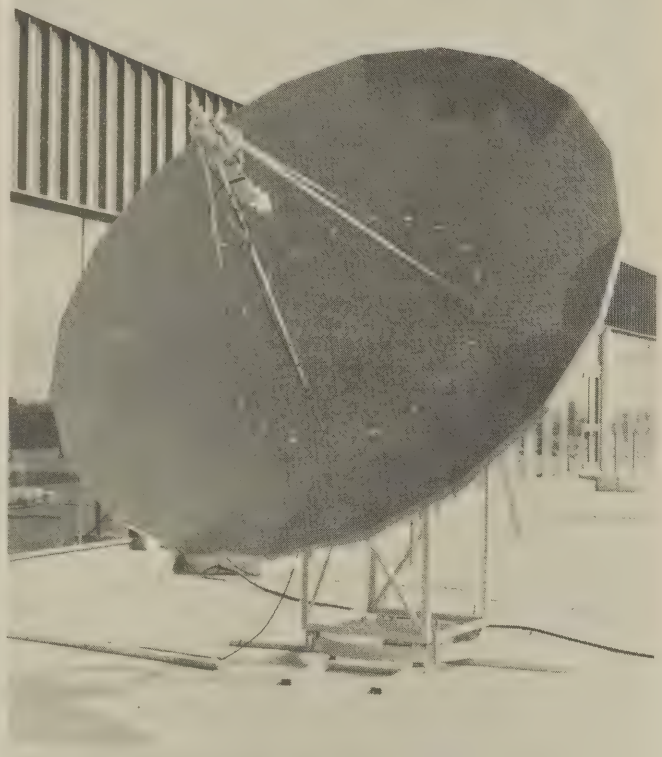


DOWN TO 4K - Promotional signs at both the DEXCEL and ICM booths proclaimed that by marrying a certain antenna to a certain LNA and a certain 24 channel receiver, the home terminal installer could be into operation for about $4,000.

Those who have been Jim Vines fans were delighted to see Jim's (almost) baby-blue parabolic at SPTS; up and running. Vines has been working for more than a year to get to the production point with his novel 12 foot parabolic antenna and SPTS was the culmination of that year-long effort. In fact, the first time the antenna was actually outfitted with a feed and LNA and hooked to a receiver was at SPTS after having been trucked down from Illinois. That took alot of guts to show up with an antenna that had not previously been field tested! Compared to the other antennas at SPTS (there were four 12 footers, and a ten footer on hand)



KINIK AND THE SUN - battling 100 degree temperatures, thousands of screws and bolts and small pieces of hardware, KINTECH's John Kinik (second from right) continues the effort to get his 12 footer operational before SPTS closed down. He made it. And then had to take the whole thing apart again!



the **PARAFRAME** (Box423, Monee, IL 60449) antenna was big and beefy and it looked as if it would do well in direct combat with a Russian TU47 tank. The last word we heard from Vines was that four to six week delivery is now 'standard'.

Stormy and Danny Weathers of **USTC** (P.O. Drawer S, Afton, OK 74331) had previously shown a 12 foot fiberglass molded antenna at the Las Vegas NCTA show late in May. When Stormy learned that some less expensive 12 footers were likely to show up at SPTS (his fiberglass antenna is designed for heavy wind loads and the CATV-MATV market) he set out to see what could be done with lightweight construction. The result was a 12 foot screen mesh antenna with a rotating feed (now a common practice, using a TV antenna rotor to twist the feed horn) which the USTC folks indicated would sell for $1750 or there abouts; but not with the screen mesh serface. Stormy decided after watching the other antennas at the show that he would feel more comfortable if the antenna was surfaced with .035 aluminum sheet. Several people at SPTS were already signed up as USTC installing distributors and Danny Weathers reported after the Seminar that USTC would be putting together around ten of the 12 foot light weight antennas on boat-type trailers so that their nationwide network of installing distributors would be able to pull up to a prospective user's location, swing the stowed antenna into position and be demonstrating satellite reception services within an hour of hitting the site.

In the LNA technology area the battle lines formed around the **SCI** 50 dB gain units and the **DEXEL** 30 dB gain units. SCI's Tom Hunpheries (3425 Kingsley Rd., Garland, Texas 75041) fresh from the CATV price wars was battle weary and ready to make his mark on the private or low cost terminal market. Art Kawai of DEXCEL (2285-C Martin Road, Santa Clara, CA 95050) had just prior to SPTS announced his firms interest in the private/low cost marketplace and he had a new 30 dB gain package on hand. The pricing of the LNAs on hand and shown varied from just under $1k to up over $1,300. SCI's Humpheries made a plea in his seminar lecture session that small terminal buyers not get 'taken' by purchasing less equipment than was required to get the job done. DEXCEL's Kawai and Yozo Satoda suggested that they would be happy to provide GaAs-FET **devices** to serious experimenters who wanted to work on their own LNA designs.

H. PAUL A SELL OUT

The Seminar was divided up so that the 'serious technical types' could attend a series of 12 satellite-microwave TV mini-symposiums staged by noted lecturer and teacher H. Paul Shuch, or attend the 'main program' in the auditorium at South Oklahoma City Junior College. Because of the overflow crowd, the lecture room set aside for Shuch was about 35% of its needed size. This resulted in a jam packed room plus an overflow crowd that had to go next door and take in the Shuch sessions on a pair of video monitors hurridly patched into the color camera videotaping the Shuch sessions. The interest in videotaping (for their own use) the full set of sessions (both the Shuch sessions plus the regular full sessions; nearly 30 hours in all!) completely surprised us. We invited attendees to bring **their own** ½ inch machines and SPTS provided a set of baseband and RF feeds in a special room designated for this purpose. The feeds ran live and parallel to the sessions in the main auditorium. At one point we counted 52 attendee VTR machines purring away in the taping room which worked out to one person in ten attending the seminar lugging with his VTR machine and all of the attachments. Machines were hauled from as far as Alaska to tape the proceedings!

Virtually all of the sessions were very well attended; the 350 seat auditorium was seldom more than 10% empty and often was filled while the Shuch sessions attracted 100+ people through the full sessions. Videotape playbacks of the Shuch sessions, through the in-house distribution system, exposed Paul's lectures to hundreds more.

Some seminar lecturers such as Taylor Howard, Robert Coleman and Oliver Swan, used videotape of their installations to highlights their lectures. Other such as Peter Zilliox of **DALSAT** (he spoke on the history of satellite communications and the way satellites operate), **COMPUCON'S** Dan Yost (speaking on terrestrial interference and how you cure it or avoid it as the case may be), DEXCEL's Yozo Satoda (speaking on the geometry of LNA design) made good use of

slides and other graphics. All in all it was a very visual (and video oriented) show. Yozo Satoda did an especially fine job explaining the intricacies of the LNA and broke the crowd up by relating a conversation he had with a seminar attendee. "This fellow came up and said that he had to put in an earth terminal at his home .... to prove to his wife that he still loved her. I guess that this indicates that the microwave technology world is really here now!"

PROGRAMMING QUESTIONS

Long before the end of SPTS '79 it became apparent that the obstacles before us for the development of a national marketplace for low cost satellite TV services was not in the technology area. Several speakers openly suggested that if the 1979 summer SPTS was proclaiming that a $4,000 earth terminal was 'here' that by the 1980 mid-year session that price might well be $2,500.

Programming, or the legal right to access it and a comfortable, economic way of controlling what could and could not be watched by private terminal operators was clearly the big issue ahead. **HOMESAT**'s Richard Campbell reported on their pioneering efforts in obtaining viewing agreements for the customers for their Homesat terminals. HOMESAT pays, up front to the program supplier, from one to three year's advance payments for the programming services selected by the private terminal buyer. However during the course of SPTS it became apparent that not everyone of the programmers on SATCOM were ready to accept that approach. Some simply, it was suggested, did not want any private terminal customers and they were either refusing to accept such contracts or alternately they were purposefully pricing their services out of the marketplace to discourage such customers. For an update report, see **Program Permission/Licensing** in the Programming Section of this issue. Several attendees were moved to suggest from the floor that if the services did not recognize the private terminal viewers and develop rational, fairly priced service agreements for these viewers, that all they were really doing was encouraging theft of their services. One attendee noted **"Anyone who opens up a beautiful new candy store in Harlem, stacks goodies in the windows and then charges $10 a pound for the sweets is just asking to have his window broken..."**.

Clifton Gardiner of the **STARSCAN** division of Gardiner Communications Corporation took the occasion of the Seminar to announce formation of a National Registration Bureau of Home Satellite Services. As the promotion sheet for the Bureau notes: **Its primary purpose is to keep interested individuals fully informed and to maintain a continuing record of all terminal owners and programming services being received so that terminal owners, as subscribers of a legally cleared service will have assurances of quality direct-to-home terminal programming, without interruptions. This can only be accomplished through controls that will provide assurances to premium channel users and producers of programming that copyright interests are being protected."**

The Bureau's concept is that by registering your

SATELLITE TO HOME - Starscan's direct (satellite to you) home entertainment package includes offerings of premium service channels, indie stations and a variety of lower-cost services such as religious and speciality programmed channels.

private terminal you will have indicated your **willingness to pay** for selected programming services **if and when** the (premium) programming service operators decide that they are ready, willing and able to deal with the private terminal market.

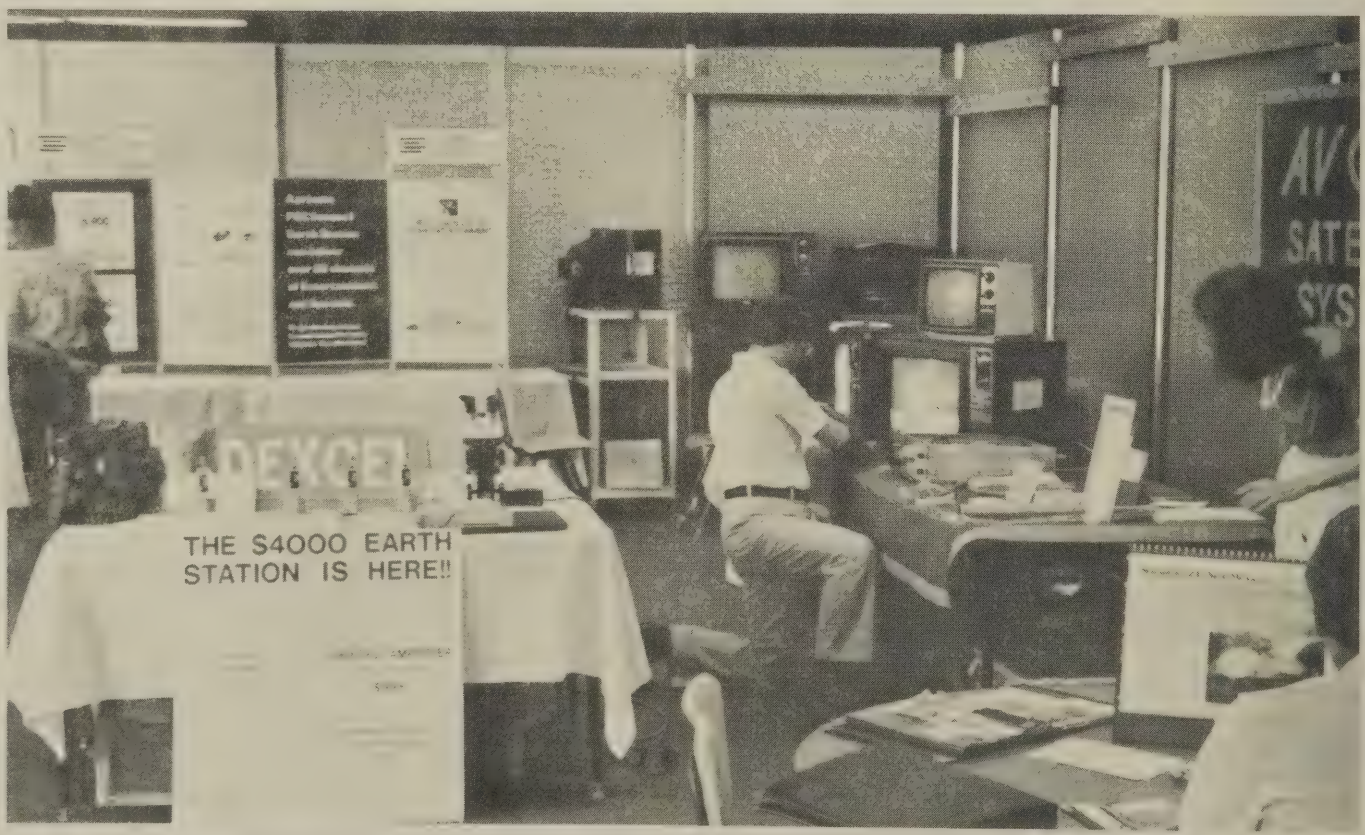
At least one premium channel service operator appeared at SPTS to announce that they were ready to accept private terminal contracts at a rate of $96 per year for their service. Al Parinello of Warner's **STAR CHANNEL** (212-484-6707) reported his premium service channel (transponder 5 on SATCOM F1) had already signed up its first private terminal viewers. The $96 rate (paid annually in advance) works out to $8 per month which is the 'average' rate paid by cable television subscribers for their STAR CHANNEL service. As good as this news for the attendees, it provoked the secondary question of 'the rate structure itself'. The logic behind the charging the normal cable rate, from the premium programmer's point of view, is that the private terminal operator/owner is a retail user of the service; not unlike the cable company

customer. In short, a private viewer is a user, not a re-distributor of the product and thus should not be entitled to the 'wholesale rate' that cable firms buy the service for, and then mark up for resale purposes. The wholesale rates range in the $3.50 to $5.00 per month region.

From the viewpoint of the private terminal operator, the rate charged should reflect that unlike the cable customer who spends nothing for capital equipment, the private terminal operator puts out several thousands of dollars to receive the service and he should therefore (like the cable operator who does the same thing) be entitled to a 'wholesale rate'. Through all of the floor to podium discussion ran the 'Harlem Candy Store' theme.

If the charges currently being suggested for private terminal reception of premium service channels (i.e. STAR CHANNEL and others that exist primarily on recent movies and specials created for pay cable services) were debated, the charges in effect for satellite reception of **non**-premium services were ill understood and hotly questioned. Sel Kremer of **Southern Satellite Systems** (918-664-4812) presented the side of a established common carrier that is bringing an independent television station to the bird. "Our tariff calls for an annual fee of $60 per private terminal" noted Kremer "and this is to be paid in advance". Kremer maintained that because of the costs of accounting and keeping proper records for the FCC, that they simply could not offer a lower annualized rate. He did suggest that the same $60 per year would also hold if the private terminal had **up to 50 neighboring homes hooked up** (the CATV rate is at or under ten cents per home per month or $1.20 per year) to the terminal. **"This really is a case of a minimum charge, which gets out of line only because the minimum charge is being absorbed by a single viewing location".** Kremer touched on a secondary question that missed the attention of most attendees (since they do not have the background of the cable industry); copyright. Under the 1976 Copyright Law adopted by Congress and signed by the President, any facility taking a common carrier delivered television broadcast signal into a **distant point** is required to (1) file their existence with the Registrar of Copyrights, and (2) pay an annualized fee of (again, **a minimum**) of $60 per year for the 'right to view a distant television signal'. So when you add the two numbers together, the common carrier minimum fee of $60, and the annualized 'minimum' copyright fee of the same amount, you are suddenly paying more per year to watch twenty four hours per day of Ted Turner re-runs of Lucy than you are paying for 12 to 18 hours per day of first run STAR CHANNEL movies from Warner!

Shades of the Harlem glass-front-window candy store. SPTS '79 had it all, and SPTS '80 sessions in south Florida in February and at Stanford University in June will be certain to carry on where both the technology and the uncertainties of a dis-orderly marketplace left off!



SET UP BEFORE THE CROWD - or clean up after a hectic day. A portion of the exhibit area (with Andy and Pat Hatfield of AVCOM right of center) during one of the infrequent periods when everyone but exhibitors were chased out to allow the exhibitors to attend to house cleaning chores.

PROGRAMMING PERMISSION & LICENSING

One of the more inportant results of SPTS '79 was the focusing of attention on the strange position both satellite programmers and would-be private terminal viewers find themselves in these days. On the surface there appears to be two willing partners looking for a preacher.

There was plenty of mis-information around ahead of SPTS as to which services would and would not deal with the private terminal viewer for cash money. We'll try to summarize here where private viewers stand (or sit as the case may be) with each of the suppliers currently on the bird.

The leader in the field, by virture of systems sold and installed to date and by virture of having been the first to enter the playing field, is **HOMESAT**; the Scientific Atlanta subsidiary formed last April to sell home satellite terminals to anyone with the bucks to afford the S-A package. As of SPTS '79 there were three such (4.5 or 5 meter) terminals licensed, installed and operating. The first three included a very large cattle ranch in New Mexico, a dis-satisfied fringe area TV viewer in Missouri and a TV sports nut in South Carolina. FCC licenses for all three were granted just ahead of SPTS and at about the same time as the FCC granted these licenses it let it be known that in the future "private satellite terminal licenses would be routinely granted" by the agency. **'Routinely granted'** is a key bureaucratic phrase; it means no more hassle, extra delays or problems for applicants who happen to want to use the satellite terminal for reception at a single home versus using it to feed hundreds or thousands of homes as CATV systems do.

Since SPTS several additionat HOMESAT installations have gone ahead, and the tempo of activity is reaching a fever pitch according to S-A's Dick Campbell. Just ahead of SPTS another formidable competitor entered the frey; Gardiner Communications Corporation fielded a new division called **STARCAN** (two Post Oak Central, 1980 South Post Oak Rd., Suite 2040, Houston, TX 77056). Heading up the new STARSCAN operation is ex-FANFARE person Sandy Freeman. Both HOMESAT and STARSCAN were amongst the exhibit hallers at SPTS and both were looking for customers.

During SPTS HOMESAT's Dick Campbell, in response to a floor question, said that **"no, S-A was not in the business of helping non-HOMESAT customers obtain the necessary contract authorizations with the various program suppliers"** while STARCAN's Freeman and Clifton Gardiner responded that **"yes, they would help would-be private terminal operators obtain the necessary agreements with the software suppliers".** To accomplish this, STARSCAN has created something they call the 'National Registration Bureau for Home Satellite Services' (713-961-7352). The NRB/HSS collects $10 in front from you and registers your home terminal. You fill out a piece of paper indicating that you are "willing to pay the tariff or contract rates" for various services you select "provided the services themselves are willing to let you take their services". The STARSCAN NRB/HSS recognizes that at least today not everyone of the 19 programming channels available on SATCOM F1 is willing to grant you permission to view their programs; even for a fee.

Which was the bottom line after three days of intensive seminar sessions at SPTS. Some of the services were willing to grant permission to view at no charge; others wanted a modest (one time or annual) fee. Still others wanted healthy annual fees and finally still others didn't want any money. They also didn't want you watching them. **Period.**

STARSCAN recognized that at least for now very few of the services which will accept private contract viewers, for a fee are ready, willing or even able to handle you on a one to one basis. STARSCAN caught the drift of this from Dick Campbell's pioneering work at HOMESAT where Dick created the 'bulk buy concept'. The bulk buy works this way. Homesat sends a flat amount to the cooperating software programmers in advance for one years' service. The flat amount is computed on the basis of blocks of customers; a 100 unit customer block is non untypical. Let's take a real world example. The new Entertainment and Sports Program Network (**ESPN**) has an established rate of $1.40. That's for life. You pay them $1.40 one time and you have their permission to watch ESPN programming on transponder 7 for ever. Your forever or their forever; which ever comes first.

Only ESPN (which gets away with this 'low rate' by the way because they are advertiser supported) does not want to hear from you with a $1.40 check. They probably spend $5.00 just opening your enevlope, looking at your check and letter, and then deciding what to do with it. So the bulk buy was born. HOMESAT's Campbell sent them a check from HOMESAT for $140. That's one hundred forty customers, in advance. STARCAN's Freeman wants his operation to operate in a similar fashion, and the NRB/HSS is part of that scheme. Only STARSCAN's approach through HRB/HSS is that **any** private terminal operator, whether they purchase a terminal from parent corporation Gardiner Communications or not, can sign up for the services of their choice. The sellers being willing to sell of course.

At the moment it appears that none of the services available, at least those who are charging fees (we'll get to who is and is not shortly), really want to hear from **you** as a single viewer/terminal. **They can't afford to handle the paperwork.** This suggests that STARSCAN has a good thing going if the program suppliers who to date have been reluctant to allow private viewers to tune in will get on board with those who have agreed to accept private viewers. This may change; as soon (or if) it does, the full details on who to write to, what to say and how much to send will appear here. In the interim we suggest that if you are a do-it-yourself terminal person that you contact STARSCAN.

Both STARSCAN and HOMESAT are gearing up for agressive advertising campaigns this fall. Most of the early advertising will be directed at regional publications (such as farm journals, etc.). Both firms are dead serious about the marketplace for commercially sold private terminals and both have at least some marketing program directed at aligning themselves with local people who will act as sales, installation or service outlets for their services. **If you are interested in representing a complete terminal packager, now is the time to contact both of these firms.** As big as the marketplace is, there is already direct competition between the two firms.

Not all of the activity is of course on this national level. Dick Campbell reports that since SPTS there have been **"numerous people in here looking for agreements with us to represent us in their areas".** In another aligned area, several dozen regional firms have sprung up acting as 'packagers of earth terminal stations' just as Gardiner Communications does on a national level. At least one of these firms may be attracting interest at a national level which could have some impact on the FCC's willingness to deregulate earth terminal licensing this fall (see **COOP'S COMMENT ON PROGRAMMING,** this issue). **Channel One, Inc.** (68 Avalon Road, Newton, MA 617/527-1025) entered the marketplace last spring. In their sales brochure (see illustration here) Channel One makes the statement that **"No license** (is) **Necessary"**, and, **"Personal and private viewing of copyright material does not require a fee of license".**

Channel One's also told the FCC, in a recent public release plastered throughout the television trade press, that they are **"challenging the FCC to come out and shut down a Channel**

Cable TV's Best Programs Are Relayed By Satellite

Enjoy Them All With Channel One's Earth-link*

If you love good TV, but have poor reception or a limited selection of local stations, then Satellite TV is for you. An Earth-link, at $15,500, will capture the incredible spectrum of television programs now beamed at North America by an RCA communications satellite. No cable system carries the complete selection.

Why Satellite TV?

In the past, slow and expensive methods, such as airfreighting tapes to Cable TV systems, limited the distribution of good shows. Since 1975 however, satellite relays have permitted instant distribution with better quality at substantially lower costs. As a result, Cable TV has grown dramatically.

Today the Cable TV operator can instantly tune in to satellite channels (called transponders) which carry programs as varied as Showtime, Praise The Lord, WTCG Atlanta, Madison Square Garden Sports, the U.S. Congress and more.

Anyone with the appropriate receiving equipment for the special satellite band can also tune in.

The Receiving System

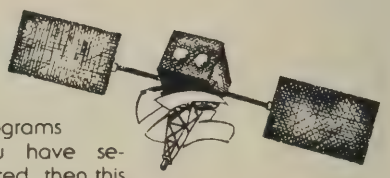
Satellite signals are weak. They require a powerful receiving system, consisting of a parabolic dish antenna, amplifier, receiver, and modulator. The result—a broadcast-quality picture in your home, perfect for wide-screen TV. No ghosts, no snow.

A clear view of the southern sky, free from obstructions, is necessary. The dish must be able to "see" the satellite, which hovers in a stationary orbit, 22,300 miles above the equator.

Simple to Operate

An Earth-link comes with only two controls. They provide fingertip choice among 24 transponders.

Should you wish to switch from the RCA satellite to a Western Union satellite, to watch PBS or Johnny Carson perhaps, the antenna must be repositioned—a two-person, 45-minute job.



programs you have selected, then this limited form of sharing can be accomplished for little more than the cost of the cable. However, if your neighbor wishes to independently select programs, then he must purchase additional equipment which will add 65% to the installed price. (If a public way intervenes, permission must be obtained from the municipality).

No License Necessary

The U.S. Department of Justice, in a filing before the FCC dated March 23, 1979, has taken the position that "existing laws do not require an FCC license to use a device that simply receives radio communications."

Copyright

Personal and private viewing of copyrighted material does not require a fee or license. Any intended use which goes beyond the home, such as trading videotapes, will require further guidance. Current copyright fees range from 1c to $5 per subscriber per month.

Sharing With Neighbors

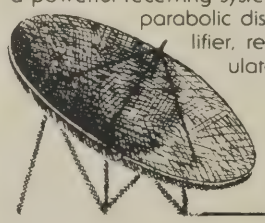
If your neighbor agrees to watch the

Condominiums and Motels

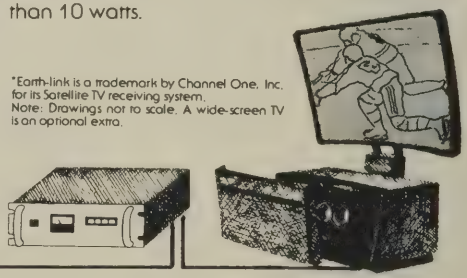
The Earth-link is designed for private homes. Channel One, Inc. has systems suitable for condominiums, hotels, resorts, bars, and so forth. Further information will be furnished on request.

Safe

Microwave signals from satellites are all around us now. This equipment is merely a receiving device. All outdoor electrical wiring is at low DC voltages and draws less than 10 watts.



Technical description: Satellite transponders operate in the 4 GHz downlink band, at an EIRP of 30 to 35 dBw, depending on location in North America. Twenty-four transponders operate in 12 channels with two polarizations (vertical and horizontal). The Earth-link uses a parabolic dish antenna of narrow beamwidth and high gain. The dish focuses signals into a waveguide leading to a Low Noise Amplifier (50 dB gain). The amplified signal travels through hardline to a 3.7-4.2 GHz frequency-agile radio. The baseband output of the receiver is modulated to VHF channel 3, 4, 5, or 6.



*Earth-link is a trademark by Channel One, Inc. for its Satellite TV receiving system.
Note: Drawings not to scale. A wide-screen TV is an optional extra.

One installation (someplace in) **California".** Channel One wants to make a test case of their contentions ("...no license is required", "no copyright fees need be paid").

The confusion in all of this stems from several quarters. During the FCC's spring of '79 "comment period" on the now promised deregulation program for earth terminal licensing, the U.S. department of Justice took the occasion to file a 'brief' in which they said (in essence) **"Hey FCC ... there is no question about whether you should allow TVRO terminals to be installed without licenses; our view of the 1934 Communications Act** (as amended) **states that you have no authority to license any receiving stations in the first place".** This sounds very impressive since it comes from the DOJ. Unfortunately, the DOJ files statements similar to this on all sorts of issues and as a rule the DOJ "comments" get ignored by the FCC and everyone else who receives them. That probably frustrates the young DOJ lawyers who spent several weekends researching their comments but that's the way it works in D.C. these days. Channel One's Fred Hopengarten, a graduate of the 1972 class of Havard Business School and an attorney, siezed upon the DOJ filing none the less and issued his 'challenge' to the Commission.

Whether the FCC has the right to 'license' earth receive terminals is, hopefully, a moot point; assuming they **do** go ahead and deregulate as they have promised. A bigger question, the one hanging up some suppliers at the moment, is copyright.

A copyright is normally thought of as a property right; the creator of something, whether the author of a book, creator of a screen play, or songwriter has the protection of the law. He (or she) is guaranteed, under copyright law, that no one else shall profit from their creation without compensation to the creator. Only copy**rights**, like movies and plays and songs, are not always passed along with the rights of reproduction **or use** of the works themselves. In fact, more often than not the copyright holder is not the person who produces a movie or releases it. It may also not be the person who created it either; since copyright**s** are bought and sold in the marketplace like any other commodity. HBO will be our example. They negotiate with a movie producer for a movie. Say **Smokey and The Bandit.** They reach an agreement wherein HBO has the right to distribute Smokey to **its** affiliates **for re-sale**, for a fee. The agreement which HBO and Smokey's producers sign specifies how many times Smokey will be shown by HBO, where in turn the HBO affiliates may show it (bars and clubs are ruled out), and what money HBO will pay for each time Smokey is played. The people who produce and distribute Smokey may in turn have a second

PROGRAM SUPPLIERS WHO WILL DEAL

Transponder	Service	Status of Private Terminal Agreements
1	**KTVU** from Warner	Unknown. KTVU's transponder 1 has had three owners in the past four months. Prior owner SSS is hung up on Copyright questions; new owner Warner is already dealing for STAR CHANNEL.
2	**PTL**	No charge, or, one time 'mailing charge' of around $2 - 3.00.
3	**WGN** from United	Tariffed at $60 per year; reported to be accepting agreements from HOME—SAT and possibly others.
5	**NICKELODEON**	Given as bonus to STAR CHANNEL; see transponder 11.
6	**WTBS** via SSS	Tariffed at $60 but hung up on copyright ramafications. Reported to be returning applications because of lack of copyright clearances.
7	**ESPN**	Entertainment and Sports Network; flat $1.40 lifetime fee. No problems.
8	**CBN**	No charge or one time 'mailing charge' or around $2 - 3.00.
9	**C-SPAN**	HOMESAT says there is no charge; cable operators pay 1 cent per home per month. It not free, probably very reasonable.
	Madison Square Gard.	Unknown.
10/12	**SHOWTIME**	Accepting $132 annual fee that includes Southwest Regional Sports package left from FANFARE days on transponder 16.
11	**STAR CHANNEL**	Accepting annualized fee of $96 and bonuses with NICKELODEON (transponder 5)
13	**KTBN** from Trinity	No charge or one time 'mailing charge' of around $2 - 3.00.
17	**WOR** from Eastern	HOMESAT says posture similar to **WTBS**/SSS; STARSCAN reports accepting tariffed fee of $60 per year.
21	**SPN**	**No charge; letter permission required.**
22	Modern Motion Pix	Unknown; logic suggests it would be free.
22/24	**HBO**	Not accepting contracts; does not want private viewers at this time.
23	HBO's **TAKE-2**	Same policy as 22/24.

(third, etc.) agreement with the copyright owners which limits where **they** may distribute it or **how** they may distribute it.

Bars and clubs are usually prohibited points of showing simply because they have no 'protected gate'. A protected gate is one where somebody is ultimately responsible for seeing that everyone who wants to see Smokey is accounted for, and pays for, that viewing. Customers wander in and out of bars; bars are not licensed as movie houses so they can't set up a 'gate' per se and collect entrance fees. The copyright owners don't like **un**protected gates so they simply exclude them from the distributor agreements and the distributor who sells to HBO in turn restricts HBO from showing Smokey in such places. The rule of thumb is that if you can't count people watching the event (or **able to** watch the event), and, collect money for **each** potential (or real) viewer, then you don't show the event.

Private terminals are viewed by the right's owners as an unprotected gate. They have tuneable receivers, the ability to tune in and tune out at will, the ability to fill up their living rooms with dozens or indeed hundreds of people. As Al Parinello of STAR CHANNEL said at SPTS "...**private terminal viewers don't concern us; yet. If everyone of you in this room had a terminal operating and if everyone of you were tuned into STAR CHANNEL, out loss would be the equivilent to a very small cable system. What worries us though is that you all have friends!"**

At the moment HBO will not accept any private terminal contracts. Dick Campbell of HOMESAT reports HBO has simply returned HOMESAT year-in-advance payment checks for the first set of HOMESAT private terminal customers. **"HBO"**, says Campbell, **"is not being hard nosed about this. They are feeling the pressure from the distributors and the copyright owners".** Which is another way of saying the HBO feels that they cannot afford to accept any checks for private terminal viewing because of what that might do to their existing relationships with existing program suppliers. HBO is also making noises about 'scrambling' their satellite signal; something we'll look at in some detail in our November CSD.

Yet at SPTS '79 Warner's Al Parinello said **"STAR CHANNEL has three private terminal viewers and we'll sign up as many as want the service who are willing to pay the rate".** The rate is $96 per year but that includes Warner's 13 hour per day NICKELODEON service (transponder 5) for children as well. SHOWTIME (transponders 10 and 12) is similarily reported accepting private terminal agreements. If the two non-HBO movie services are willing to accept private terminal

viewers (and in a given three month period the major release movies will appear on **all three** services), why not HBO?

Some theorize that HBO has something else in mind. Maybe a service designed and dedicated for the private terminal viewers. Maybe even on another satellite; that is, one away from the 'temptations' offered by the "cable satellite". We'll look at that in the November CSD as well.

So where does that leave us today, in the first week of October? As the table here shows, there are some you can deal with and some you cannot. For those that you can, at least for now, you are much better off going through someone such as STARSCAN to get your permissions and agreements sorted out. And behind all of this Fred Hopengarten keeps taunting the FCC hoping that **he** will end up in court.

PROGRAMMING CORRESPONDENCE

STAYING LEGAL

It was a pleasure attending SPTS '79. Like many young and aspiring companies that we met at the Seminar, we intend to market and service TVROs to the general public. We have put together a professional brochure, have our own portable TVRO on a trailer, our own place of business, and will begin advertising in this area shortly. However we have some questions regarding being very sure that out approach to marketing is not going to get ourselves or our customers into trouble.

1) What steps should we take to protect us and our customers from legal problems at the local, state or federal level?
2) What 'key' statements should appear in our advertisements, sales contracts and agreements to keep us out of 'hot water'?
3) What potential problems could stem from the public ad campaign and exposure of TVROs to the public?

Robert L. Young
Satellite Television Systems
Box 11249
Reno, NV 89510

Very important questions indeed and we'll attempt to answer them here. At the local level the only concern should be local zoning laws. Many communities have local ordinances limiting the height of structures on the property and numerous amateur and CB enthusiasts have had problems with these ordinances. The low profile of a TVRO antenna however should not be a problem here. If a customer of yours should decide to inter-connect other homes to the 'master TVRO antenna' however, he needs to be sure that under local ordinances he is not engaging in a 'business activity' within an area where only residential housing is permitted. At the state level, the only possible problem might occur in states such as California or Oklahoma where we are aware that 'theft of telecommunication laws' are on the books. Under these laws it is an offense to engage in the 'theft' or 'reception' of telecommunication signals not intended for the user. The same law in the two states noted also makes it an offense to 'assist others' in receiving telecommunication signals not intended for the user. The clear solution here is to engage in reception for only those signals **for which the user has been granted authority to receive. At the federal level under the** now-current **FCC rules every operator of a TVRO terminal must have both a license to construct and operate the terminal (from the FCC) and either the written permission or some contractural authority of the various programming sources that will be received. Even if the FCC does away with mandatory full-blown licensing** (see News Update this issue), **written or contractural authority** for **accessing the various transponders will still apply. Anyone engaging in the sale of satellite terminals would, we believe, be smart to include a 'sign off' form in the paperwork in which the customer accepts the terminal as a satisfactory installation and in which it is noted by specific listing the transponders which the customer/user has received advance authority to access. In that way if after you leave the premises with check in pocket and the customer engages in reception which he is not entitled to you and your firm are not a party to the 'signal theft'.**

HELP WANTED

Can you please furnish information on 'Home Satellite TV Reception'? We moved to this area from Seattle where we had cable TV service and Home Box Office. Here between two hills we get two stations, sometimes. Often on one channel we get picture but no sound, or vice versa. We have traveled through Mexico and up the Alaskan highway and in both areas where there is population the TV reception runs to 3 or 4 channels and good quality color. So here in this great country of ours, only 100 miles from Seattle and 38 miles from Wenatchee (where they have cable) we get garbage! We have asked TelePrompTer of Wenatchee about the chances of getting service out here and they say never. We need some help!

Rhodo Schinman (and alot of neighbors)
Star Route, Box 73-S
Leavenworth, WA 98826

Because of the widespread distribution of our STT 'Satellite Study Package', we receive dozens of letters per month from people in the same fix as Mrs. Schinman. Naturally many end up getting started in satellite TV reception through the 'Study Package'. Most however are non-technical and they just want to be able to get TV like the big folks do. We are considering simply running a 'Help Wanted' listing in CSD each month and allowing the competitive forces of the readers come into play. In effect, these are sales leads for all of your fellows engaging in the sale and service of satellite receiving systems. Anyone have any objections to this approach?

AUDIO TERMINALS

How about satellite audio services, like AFRTS programs? These must be far simpler to receive than video since the overseas bases I am familiar with seem to get by with much smaller antennas. Can you furnish information on frequencies, powers, modulation standards, etc.?

Jon B. Hagen
Arecibo Observatory
Arecibo, P.R. 00612

Audio-only (or narrow-band only) terminals are, we feel, about to bust out. Up until now TV has held the limelight simply because of the extra attraction of getting pictures with the sound. The audio-only terminals are indeed far

simpler to build and operate. On transponder six of WESTAR I (99 degrees west) **there are typically four separate NPR** (National Public Radio) **audio channels in operation. Using an SCPC** (single channel per carrier) **format that is FM with a 75 KHz peak deviation and a 15 KHz maximum audio frequency, one of the best tricks is to downconvert the transponder 6 range** (3900 to 3940 MHz) **to not the standard 70 MHz i.f. but rather to an i.f. of 88 to 108 MHz. This allows you to plug the i.f. output directly into a standard (good grade) FM tuner/receiver and tune in directly the FM audio signals on the standard tuner/receiver. We have several enthusiasts working on this project and expect to have a couple of articles on the subject in the next few issues. If you are involved in this activity, we'd like to hear from you as well!**

DELIGHTED IN CHILE

I was very delighted with the tapes that just recently arrived from STT showing the Jupiter Fly-By of Voyager I. Do you have tapes available of the Jupiter Fly-By from Voyager II?

Adolfo Araya Gauna
Santiago, Chile

STT does have a 12 hour BETA-2 or VHS(LP) set of videotapes available from the Voyager I Fly-By of last March; but none of the Voyager II. Readers interested in astronomy, science classes et al who would benefit from the excitement of the 12 hours recording the Voyager I Fly-By pass are urged to contact STT directly at P.O. Box G, Arcadia, OK 73007.

ADVANCE PROGRAM SUGGESTED

I was a registrant for SPTS '79 and while pleased with the show, an advance seminar registrant should I believe have access to an advance program schedule. My interest in SPTS '79 was to gain a better understanding of the marketplace and product development. A program of the Seminar, prior to arrival, would have helped me better plan my own arrival and travel plans to ensure that I was on hand for the sessions that interested me most. Unfortunately, three seminars (The Private Terminal Markets 1 and 2, and, Private Terminals and the Legal Implications) were missed by travel plans that had been pre-arranged. I am interested in the 1980 seminar series and would appreciate receiving information, when available, on their format and content.

H. MacLean
Market Analyst
ELETROHOME LIMITED
Kitchener, Ontario

Agreed. We kept the seminar by seminar session line-up under wraps until the very last minute at the first SPTS. We'll have a broad outline here in CSD for the two months prior to the first SPTS in South Florida in February and again for the Stanford Seminar in June. For those who missed any sessions (or all, in case you were among the more than 200 who wanted to attend but could not because we were sold out!), every SPTS session was videotaped and we have more that 30 hours of color videotapes available at reasonable pricing. To obtain a list of the videotapes available, on VHS (LP) and BETA-2 format, write: Tape Time, STT, P.O. Box G, Arcadia, OK 73007.

NATIONAL SPACE INSTITUTE

Satellite Week (publication), in its very first issue, reported on a satellite seminar which you were scheduled to hold in Oklahoma in mid-August. It quotes you as saying that 'the $2,000 satellite TV receiver is here now, and a $1,000 receiver is expected by next year'. The National Space Institute, a non-profit group concerned with promoting a strong comprehensive space policy, would like to know more about the apparently growing market for satellite TV. We would be grateful for any information you can provide concerning the past and future growth of TV satellite services in general. I'd be most interested in learning about the results of your first seminar.

Courtney A. Staad
Special Asst. / Policy
National Space Institute
1911 N. Fort Nyer Drive, Suite 306
Arlington, VA 2209

The NSI was founded by Dr. Wernher von Braun and on it's Board of Governors is our front cover hero Arthur C. Clarke. They put out an interesting (if not savvy) publication which readers might wish to investigate.

TVRO OWNER'S ASSOCIATION?

Can you please tell me of any private TVRO terminal owners' clubs or associations, which I can join? I would very much like to see a group started for the exchange of information, to root out dishonest hobbiests, to work towards legalization of our hobby, and to enable us to establish and maintain a good healthy rapport with those who's signals we receive so hopefully they will not take unfortunate actions against us in the future.

Paul Manning
4426 Arbutus Street
Vancouver, B.C. V6J 4A2

During SPTS '79 there was the first (faltering perhaps) step begun in that direction. A steering committee made up of about a dozen attendees met to discuss how present and prospective owners of private satellite terminals might pool their resources to establish just such a group. The group is led by Michael Salem (225 W. Lindsey, Norman, Oklahoma).

SATELLITE TV EXPERIMENTERS
INTRODUCING A COMPLETE
3.7 — 4.2 GHz DOWNCONVERTER
- 3.7-4.2 GHz in, 70 MHz out
- Remote, one control tuning
- Dual conversion - stable
- Assembled & tested Only $895.

Polar Mount and Remote Feed Rotation Plans For Your Dish.
SUPER! $10.00 postpaid

EXPERIMENTERS SUPPLIES
- Teflon PC Board, dielectric constant 2.55 1/16''x9''x3'' (approx.) $10.00
- 1/32''x9''x4'' (approx.) $18.00
- Chip capacitor kit 12 each, 6 total: 18, 27, 39, 220, 4700 pf... only $18.00
- SMA and microwave connectors, inquire
- 2''x14'' copper tube for Birkhill feed, 3 lbs. $12.00

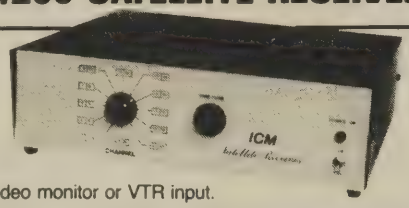
WRITE - We are adding to our inventory!

SATELLITE INNOVATIONS
P. O. Box 5673
Winston Salem, N.C. 27103

Add $2.00 shipping and handling (except for plans)

THIS PRODUCT NO LONGER AVAILABLE

NEW ICM TV-4200 SATELLITE RECEIVER



Provides You With These Features For $1,995

- Output levels compatible with video monitor or VTR input.
- Dual Audio Outputs 6.2 and 6.8 MHz. • Built in LNA power supply
- Tunable Satellite channels 3.7-4.2 GHz.

International Crystal Mfg. Co., Inc.
10 N. Lee Oklahoma City, Ok. 73102 405/236-3741 ICM

Mike is an amateur radio operator (N5MS) **and an attorney and from our viewpoint he should be well qualified to provide the guidance required to get such a group off the ground. As things now stand Michael needs a showing of support and interest, and hopefully by the time we get to SPTS '80 in South Florida in February the group will be prepared to stand up and be counted.**

STOPPING THE SHOW

I attended the Oklahoma City SPTS and was amazed at the amount of information I was able to acquire. This was a good program and you deserve credit for the courage to do it. It surprised me that some interests wanted to stop the Seminar before it began. They might as well try to stop a hamfest where they teach how to build shortwave receivers! My main interest is the potential for selling **legal** systems in our area and I am presently talking to all of the prospects I can locate. It seems as though the hardest nut to crack will be the programming rights aspects of the system. We'll probably come to the Miami SPTS and look forward to seeing everyone there ...

Al Bruan
Alaun Engineering
Montrose, CA 91020

We'll keep track of the programming rights question month by month, but see it starting to shake out.

TAKING DISCOUNTS

I was excited by the promotion sheet on Coop's Satellite Digest and wanted to be one of the 'Pioneer Subscribers'. Only one thing missing...since Pioneer Charter Subscribers are entitled to a 10% discount on their purchases from STT how do we take that discount? I ordered the Swan Spherical Antenna Manual today from Arcadia today ($30) and the 'Satellite Study Package' from the Napa address ($16) but there is no place on the order forms to take the ten percent discount.

L. Robert Hoffman
(someplace in) Mexico

We've given that problem considerable thought. If we place an actual line on all of our many order forms where the buyer can subtract ten percent from the order because he is a 'Charter Pioneer Subscriber' **to CSD, we'll end up with** almost everyone **taking the discount on everything whether they are entitled to it or not. The 'Satellite Pioneer Certificates' are being prepared, will be mailed during October and instructions for discount taking will be included. Oh yes, we are 'sold out' on Charter Subscriptions so if you delayed sending it in until now, the full price applies. Reader Hoffman is, like many other expatriate Americans living in Mexico, now building a private satellite terminal to get a bit of Norte Americano video into his sleepy Mexican adobe.**

TAPES FROM SPTS '79

It was a pleasure meeting everyone at SPTS as well as being informed of the developments in the private terminal market. As a Systems Engineer for HBO, my particular interest was in the technology of the equipment for home satellite TV reception. In trying to coordinate my time between the tape room sessions, and the main theatre talks there was quite a bit of information I had to miss. Please supply the video tapes listed here for my further study. I attend, as part of my job assignment, many seminars and conventions within this field and let me say that SPTS '79 was on a very well coordinated and highly professional plateau.

Daniel A. Rutman
Systems Engineer
HBO - Home Box Office
New York, N.Y. 10020

One of the most popular sets of tapes is the 8 tape lecture series from H. Paul Shuch on satellite-microwave TV technology. STT has this 8 lecture series on VHS (LP) and BETA-2 for a special package price; see advertisement on outside back cover of this issue.

PERMISSION TO VIEW

I am constructing an earth station and would like your permission to receive your program via RCA SATCOM FI, transponder 21. Your assistance will be greatly appreciated.

Edmund R. Rogers
West Haven, CT 06516

I am writing in regards to obtaining authorization to receive program material from SATCOM I, transponder 21. Please include any information regarding licensing TVRO stations.

Gerald J. Godfrey
Buffalo, N.Y. 14202

I would like to build a TVRO and I would like your permission to receive your program 'Satellite Magazine' which airs on RCA SATCOM I on transponder 21, per your 'Home Satellite TV Reception' Handbook.

John Dubry
Yucaipa, CA 92399

We have received several dozen letters in recent weeks along these lines, and as page 26 of 'the Handbook' states we generally give permission to those who write for same to tune in our weekly 'Satellite Magazine' program on FI, transponder 21. The schedule for the coming week's programs appears in this section of CSD. Our permission extends only to our program; we have no authority to extend permission for other programs seen on transponder 21, nor for other transponders. However, Satellite Program Network (P.O. Box 45684, Tulsa, OK 74145; attention Kip Farmer) **makes no charge for receiving their transponder 21 programs and they should grant you a letter of blanket authority to tune in their program schedule which now runs more than 20 hours per day if you will write them directly.**

PERMISSION TO BROADCAST

Please advise immediately if you are intersted in having Satellite Magazine (program) carried on a regular television broadcast station and if you have the program right to do so. SPN has received a request to be carried on a non exclusive basis by an independent TV station.

Lynn Farmer
Program Director
Satellite Program Network
Tulsa, OK 74136

We of course granted the permission. If indie stations

start taking program feeds from SPN, a whole new non-cable audience will begin having access to satellite distributed cable programming. The possibilities fairly boggle the mind!

RESELLING THE HANDBOOK

Having just read your book, Home Satellite TV Reception, and finding it very informative and easy to understand, I would like to make a simple business proposal. I am in the mail order intormation and electronic kit business. Most of my customers are involved in CB radio, but I an sure many would be interested in buying your book. I would like to know if I can resell the book on a drop ship basis, or, by stocking and reselling from here. What say?

Lou Franklin
President
C.B. City
Woodland Hills, CA 91365

The Home Satellite TV Reception Handbook is generally not sold as a stand alone product; it is a part of **our 'Satellite Study Package' which also includes our 22 by 35 inch two sided four color wall chart showing satellite locations and operations. The price for the 'Satellite Study Package' is $13 in U.S., $16 in Canada and $20 elsewhere via surface mail; U.S. funds. More than 10,000 of the packages have been sold so far this year and in fact most of the people interested in satellite TV have come into the field through the 'study Package'. For the time being, we will continue to be the sole distributor for the package.**

COOP'S SATELLITE MAGAZINE SCHEDULE

With the assumption that RCA allows transponder 21 to remain with SPN (Satellite Program Network) through the month of October, here are the **SATELLITE MAGAZINE** program schedules for October and early on into November.

Satellite Magazine is produced by STT's Bob Cooper, is one hour per week, and is scheduled to run at 12 noon eastern time (etc.) on RCA SATCOM FI, transponder 21 each Thursday. The program is cycled so that each program repeats for two weeks, resulting in two new programs per month.

Program Contents	**Run Dates**
Highlights of SPTS '79 including Yozo Satoda of DEXCEL, Inc. (on LNA design), Al Parinello of STAR CHANNEL and Sel Kremer of SSS (on program rights agreements for private terminals) and Oliver Swam on Spherical antennas.	9-27, 10-04
Dana Atchley hosts with guest Wayne Kines who is involved in design and operation of the world's largest cable television network, operating in rural Manitoba, Canada.	10-11, 10-18
Paul Shuck excerpts from SPTS '79 covering superhetrodyne downconversion techniques.	10-25, 11-01
Paul Shuch excerpts from SPTS '79 covering modular TVRO receiver designs.	11-08, 11-15

If SPN is not allowed transponder 21 on a regular basis (see other reports this issue on failure mode problems with SATCOM FII and their impact on FI), we must assume that that Satellite Magazine program series may, like other SPN offerings, be off the air until RCA's FIII bird is launched and made operational sometime after January 1st.

PROMOTIONAL DATA AVAILABLE

Alternate Information Sources

Satellite Week (1836 Jefferson Place NW, Washington, D.C. 20036) is a weekly first class mailed newsletter providing extensive coverage of legal, WARC, programming, satellite operations news in abbreviated format. Published by same folks who have produced Television Digest for 34 years; recommended reading for serious enthusiast but expensive ($327 per year).

Satellite News (8401 Connecticut Avenue, Washington, D.C. 20015) is issued every two weeks, mailed via fist class mail, providing coverage of programming and some operational aspects of the satellite television business. Subscription price is $147 per year.

INSTANT REPLAY is an unusual videotaped 'magazine' produced in Florida by a very talented crew that attempts to give you a monthly 'magazine on videotape' using video enthusiast news features compiled all over the world. Recently coverage of satellite activities (including SPTS 79) has expanded and we are told that satellite terminals will be seen more and more frequently on the magazine-produced-on-videotape in the future. For full information including subscription data, write 4149 Bonita Avenue, Coconut Grove, FL 33133 (305-666-6787).

For fans of magazine articles dealing with satellite television reception, here is the current crop of such articles:

73 MAGAZINE - thirteen page feature written by Coop way back last February will appear (according to advance notice) in the November issue of this popular amateur radio magazine. For readers who are hooked on current-only material, our apologies 'in front' for the semi out of date nature of this material. That's the publishing biz!

VIDEO - a very good outline of what home satellite TV is about, originally written in June of this year, appears on page 44 of this snazzy six-time-a year newsstand distributed publication. Same issue has interesting piece on Ted Turner's WTBS, VHS versus BETA format

operation, video hardware tests. Front cover has 'three headed man' puzzled over VHS versus BETA format; front cover dated November. Article written by Coop (naturally!).

RADIO ELECTRONICS - Part three of a six part series scheduled for October issue of RE; the wrap up of the introduction to home satellite TV reception. Final three parts dealing with the mechanics of assembling the station, will probably not start before January however.

Those attending SPTS '79 saw the **NBC PRIME TIME SUNDAY** crew with Jack Perkins roaming around shooting videotape, conducting interviews and generally collecting material for what was expected to be an early-fall airing of the subject. Where is that project now? Producer Bob Eaton tells CSD that because another group at NBC did a three part mini-series on the NBC Nightly News on the overall subject of satellite television the week of September 17th, the PRIME TIME crew is simply uncertain when they will complete the private satellite terminal piece and schedule same for airing. As it now stands they have tape 'in the can' from SPTS in Oklahoma City, a visit to Coop's private (experimental) terminal, a visit to the Scientific Atlanta first full-blown private installation at the Bell Ranch in New Mexico and so on. Eaton feels that they **may** plan on running it on Synder's program around December first to 'coincide' with the launch of RCA SATCOM FIII. An earlier run is very unlikely. Watch you **TV GUIDE** listing for the Sunday night program and **if** we have sufficent notice, you'll read about it here in advance of the air date.

PROGRAMMING SERVICE CHANGES & ADDITIONS

ESPN LAUNCHES

A novel new service debuted at 7 PM eastern on SATCOM FI transponder 7; the Entertainment and Sports Programming Network (ESPN). ESPN is promoted as a "24 hour per day sports channel" available through cable systems. The service is advertiser supported, and **there is a one-time fee for becoming a viewer of $1.40.**

ESPN has had a checkered history; the service was due to launch last spring and in fact did make a few telecasts on transponder 7; primarily New England area college sporting events. Early indications were that the service would be a New England area regional service transponder with a mixture of sporting events from New England area colleges and Universities, plus some entertainment events of interest to that region. However during the late spring the ownership of the service changed hands to the present 'Getty Oil Company' backing and the concept for the service expanded to a full time, primarily sports service. A sampling of a typical day's programming is shown to the right.

Although the schedule shown here indicates a very full schedule, during the weekday daytime hours the service is often 'between programs' with a color bar pattern supered with the schedule for that day and the balance of the week. Creating a full twenty four hour sporting schedule on a seven day a week basis has its own problems not the least of which is finding enough sporting material to fill the air time! As you might guess some of the 'events' televised are of marginal interest except to the participants and their close families. Overall however the service gets good marks for reasonably good production quality, a varied if not totally interesting schedule and the reasonable life time rate of $1.40.

A.M.

12:00 Sports Recap
12:30 Sports Hot Line (R)
1:00 Wednesday Night Fights (Professional Boxing) (R)
3:00 NCAA SOCCER: Brown at Boston University (R)
5:00 Women's Field Hockey: Springfield at Boston College
7:00 World Classic II Arm Wrestling from Las Vegas, Nev.
7:30 IKF Kart Racing (R)
8:00 Sports Recap
8:30 Pony League Baseball World Series
10:30 Babe Ruth Baseball World Series

P.M.

1:00 NCAA Football Preview
1:30 Hall of Fame Lacrosse (All-Star Game)
3:30 World Classic II Arm Wrestling from Las Vegas, Nev.
4:00 Women's Volleyball from San Diego State
6:00 Sports Recap
6:30 National Baseball Congress Tournament
9:30 Rugby Union (England vs. Ireland)

BIRD OPERATIONAL NOTES

FOR YOUR EARTH STATION, CHOOSE
AVCOM'S PSR-3
SATELLITE VIDEO RECEIVER
DESIGNED FOR YOUR PRIVATE TERMINAL
- Remote tuning
- Dual video outputs
- Exclusive Clamp-Sync & Scan-Tune
- Many other features!

AVCOM of Virginia, Inc.
10139 Apache Road, Richmond, VA 23235
(804)320-4439

WARC - currently being held Switzerland will determine the shape of terrestrial and satellite frequency allocations for next twenty years worldwide. Preliminary meetings held over past several years indicate trends but few certainties in the satellite area. Out of WARC will come solid allocations or recommendations for host of new earth-to-satellite and satellite-to-earth 'bands'. Some will be earmarked for ''direct to home broadcasting'', others for general (common carrier) use. Most bets are that ''direct to home broadcasting'' will not be assigned for North America; at least not U.S.. Canada however wants it, is pushing for preliminary agreement now and then hopes to have final agreement at 1983 ''regional'' meeting. There is no concensus even within regions of world of where these up and down link bands will be after WARC finishes. Present C-band (3.7 to 4.2 GHz) seems unlikely spot however for **any** direct home broadcasting; some favor lower frequency assignments (some are suggesting spectrum in 2.5 GHz region) but most see direct broadcasting satellites in high-11 to 12 GHz region. Actual allocations for service are likely to be anti-climatic since major hurdle or approving **premise** seems to have been cleared. U.S. position and Canadian position differ widely leading to speculation that nothing may be settled **in North America** until after 1983 time frame (next regional meeting). If any question of major significance is to be resolved it will be finding home for **uplink bands** for direct to home broadcasting satellites. Apparently worldwide the terrestrial microwave allocations are such a hodge-podge there is nothing like a 'clear' or 'unused' or even 'lightly used' 500 MHz spectrum available universally. Likely prospect is that different uplink bands (probably between 10 and 15 GHz) will be used as fits the local terrestrial situation. WARC will drag on for several more weeks.

GLODOM (Global Domestic Satellite System) in proposal prepared for ITU does suggest international direct to home broadcasting system in C-band using 24 transponder birds with $15,000 receive terminals (they apparently did not have a representative at SPTS!). They project 1982-3 launch cycle but because of opposition from present C-band users nobody expects proposal to fly. U.S.S.R., Europe, and U.S.A. would be **excluded** from coverage areas.

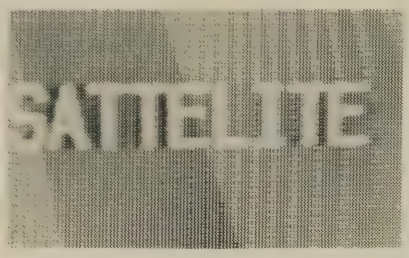
ANIK-B, the dual-band RCA Astro Division bird made operatonal last February at 109 degrees west is starting 'long term tests' of direct to home broadcasting in Canada; using 12/14 GHz six channel portion of bird. Downlinks involved are 11,700 to 11,780; 11,780 to 11,860 to 11,940 to 12,020 to 12,100 and 12,100 to 12,180 (each 80 MHz wide). S. E. D. (a Saskatchewan based Canadian manufacturer of TVRO gear) has produced 100 1.2 and 1.8 meter receive terminals; suggests 'quanity pricing' in $500 region per terminal. To satisfy the political pressures in Canada, entertainment programming (from CBC service) will be heavy part of schedule. ANIK-B on 11/12 GHz downlink uses trio of 'spot beams' and with rapid 'falloff' beam is not likely to be 'useful' very far south into U.S.. Canadian authorities are openly admitting 'hundreds of private satelltie TV terminals now exist in Canada' and hope appearance of ANIK-B 11/12 GHz tests will keep Canadian out-back viewers (1) happy, and, (2) discourage them from watching U.S. programming via SATCOM and WESTAR.

TORUS antenna - COMSAT has applied to FCC for permission to build and use antenna design called 'Torus'; a spherical-like antenna measuring 10 by 14 meters in size. Antenna, if approved by FCC will cost COMSAT 1.1 million per copy and will be installed at COMSAT gateway stations located Jamesburg, Ca., Andover, Me. and Etam, W. Va.. Torus is very much related to Oliver Swan's Spherical Antenna, operates on almost identical theory, can feed several birds at same time with offset feed horns. Only COMSAT could turn a 'duplicate for $300 Swan Spherical' into a $1,100,000 project!

BIRD talk. Canada has moved CTS-Hermes four channel 12 GHz experimental satellite around equator to west to give Australians something to play with. Aussies are getting poor deal however; bird has been on last legs of its experimental life for several months. Australians are three to five years way from having own bird. ATS-6, the original video rover, is dead. NASA shut it down and dropped it to 325 mile height to insure it does not get in the way of other birds in geostationary orbit. Bird ran out of fuel, was widely used over North America, India and during last operating months relayed television and data to American Samoa and Guam in 2.6 GHz band originally used for 1975 test over U.S.. RCA asking for permission to launch SATCOM IV to 83 degrees west and also asking for permission to build SATCOM V for on ground spare. Current plans for launch of SATCOM III November to early December continue to look good. COMSTAR IV meanwhile (ATT/GT&E satellite) is on spot; either must launch by 1981 or not at all. COMSAT's big bird is not compatible with Space Shuttle and worse yet not compatible with Delta launch vehicles. Only Atlas Centaur can lift bird into orbit and pad 36A which is Atlas launch pad is supposed to close by end of this year; in any case no later than early 1981.

TURNER's new 24 hour per day news service, meanwhile, is moving ahead. Heavy advertising indicates service is looking for engineers, producers, technicians and others **now**. Most recent press releases indicate Turner has passed 1.2 million home mark in pre-sign-ups. Turner had originally said the charge would be in 15 cent per home region until they got into 7.5 million homes, at which point service would be free to cable systems because advertising could support it. Turner has been saying in public start date would be mid-80 but if Washington-Post is on way with similar, competitive service, Turner's start date could well advance.

SPN programming on transponder 21 (that's an advertising, no charge service) is looking better every month. Recent addition has been VCI Movie Time in prime time weekend slots with fairly recent G and GP movie fare (advertising supported).



HBO was final choice of Holiday Inns. Presently being installed are around 75 terminals at first of Holiday owned and operated Inns. Only owned and operated Inns will have service for next six to nine months, eventually will spread out to franchised Inns. HBO service will be 'free' to Holiday customers and HBO says that over 100 million people per year use Holiday; HBO feels this will be good for their service expansion since millions will become familiar with HBO service for first time through Holiday Inn registration.

JAPANESE groups interested in direct to home satellite broadcasting in that country have formed broadcasting and telecommunications organization to plan the operation of the service in that country. Present BSE satellite is strictly experiment; next step will be dedicated satellite(s) for that service with satellite launch seen by 1982/1983. Whole program was approved by Japanese Diet in June.

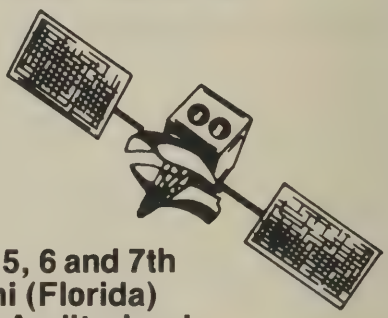
INDONESIAN satellites Palapa I and II, currently being used for **some** relay of 'regional television programming' for neighboring Brunei and Phillipines, will be model for expanded 'regional domestic-plus' satellite system. Indonesia is planning Palapa-B that has characteristics of Canada's (RCA Astro produced) ANIK-B; operational on both C band and 12 GHz, for 1982/83 launch. They say they have agreement worked out with Thailand for use of B series bird(s) and expect to announce similar arrangement with Malaysia soon.

AUDIO via satellite services continue to grow but inspite of their numbers the service doesn't attract the interest of video. In most recent activities, MUZAK will install 400 audio receive only (ARO) terminals around the country. RKO radio is now using Western Union to distribute 3 minute hourly newscast to subscriber stations; sharing AP located ARO terminals. AP's first 3 meter terminal went into WGST in Atlanta; 37 total planned in initial 'test phase' of feeding "wire-service" news directly to station customers. (The next generation of radio new-jockies will have to learn to say "I have ripped the following off of the satellite..." rather than "I have just ripped the following off of the **wire**"!). Western Union WESTAR seeks rate increase for voice circuits at FCC; would go up 5-7% to $550 per month for a twenty four hour per day 4 kHz voice grade circuit between New York and Chicago or to $4,950 per month for a 48 kHz wide full time channel.

SIN reported to be ready to turn on first translator fed via satellite; in Denver area. Numerous applications pending at FCC for satellite delivered services to be re-radiated in local area via 100 or 1,000 watt UHF translators.

Among many new satellite programmers announcing they will use FIII is Black Entertainment Network; a two hour or so per week offering (tenatively scheduled for C-SPAN and Madison Square Garden transponder 9) that will be commercially sponsored. Another service planning FIII debut will program 12 or more hours per day to geriatric trade; programming specifically for people over 50. Sort of Lawrence Welk times 12, seven days a week! Small or minority group television is bound to grow at rapid rate after FIII is active, much of it will be for a few hours per day or a few hours per week and the satellite will be the inter-connection system. That a hard core porno channel service has not surfaced is the wonder of where all of this is headed ...

SPTS 80 MIAMI



FEBRUARY 5, 6 and 7th at the Miami (Florida) Bayfront Park Auditorium!

MORE THAN 25 SEMINAR SESSIONS jammed into three activity packed days. H. Paul Shuch, Taylor Howard, Oliver Swan, Robert Coleman and nearly a dozen other 'satellite-innovators' will teach the latest in low-cost satellite TV technology.

SPECIAL SESSIONS AIMED AT MARKETING the satellite TV service to rural residents of North, Central and South America. A special session devoted to reception techniques required in the far eastern caribbean, and Central America; a separate session (in Spanish!) to teach reception techniques and requirements in northern South America!

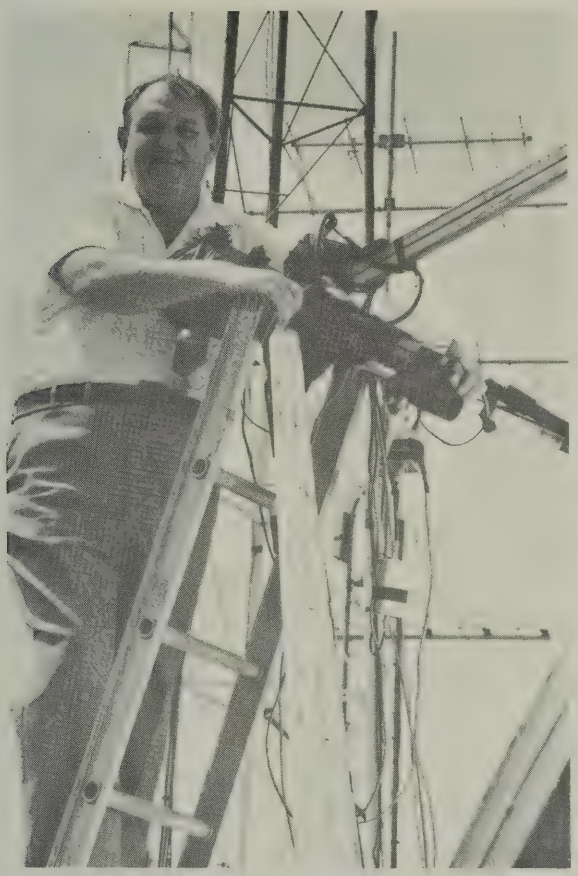
SPTS '79 WAS A SELL OUT. Registration forms are now available for SPTS '80/Miami. Each registrant will have the option of receiving the Howard, Coleman and Swan TVRO system manuals as a part of his registration package. Come to SPTS '80/Miami and learn all about the low-cost satellite TV revolution, what it means, and how to be a part of it. Call or write for your registration forms now ... don't be left out when SPTS '80 fills up!

SPTS '80 / MIAMI

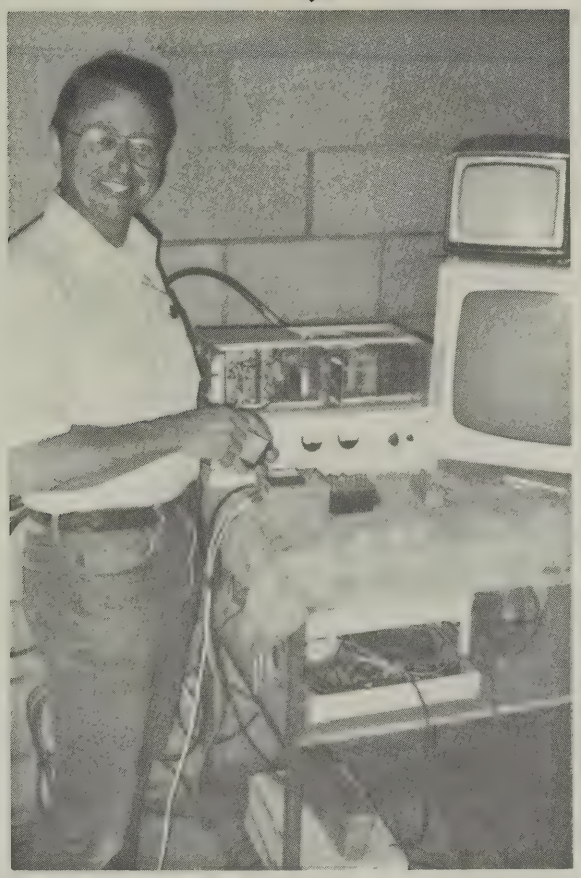
Write: SPTS '80/Miami
P. O. Box G
Arcadia, Ok. 73007

Call: Satellite Television Technology
(405) 396-2574 between 9 AM and
4 PM central time weekdays.

INTRODUCING....



MR. CHEAP



MR. CLEAN

Robert M. Coleman of Travelers Rest, S.C. has been dubbed 'Mr. Cheap' because his approach to designing and building low-cost TVRO terminals is bottom line slanted. H. Taylor Howard of Stanford University, on the other hand, wants every electron in place and every cable harnessed. So we call him 'Mr. Clean'.

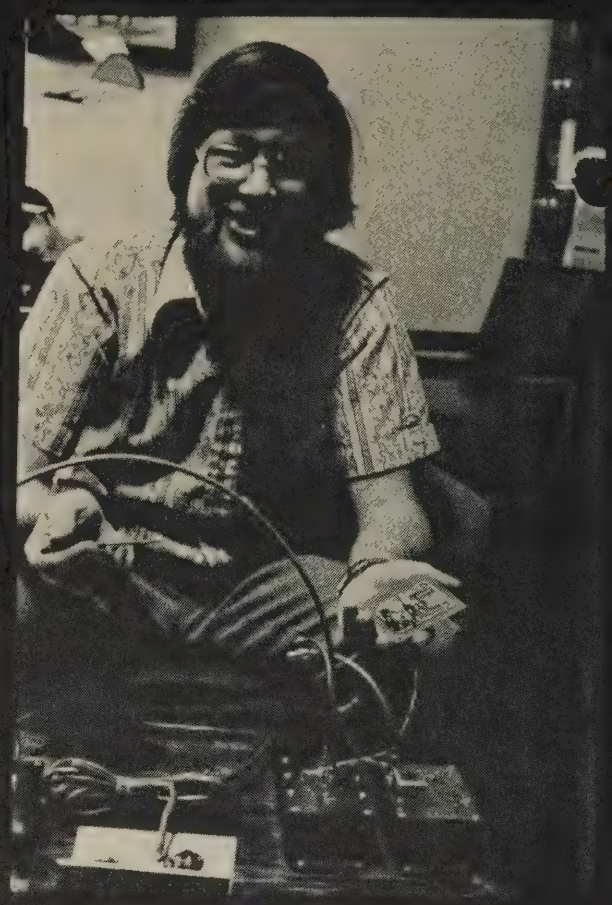
The Howard Terminal produces perfect pictures. Featuring a Howard designed and tested bi-polar LNA package, a Howard conceived fully frequency-agile 24 channel tuneable receiver (with selectable audio sub-carriers) the **HOWARD TERMINAL MANUAL** leads you gently from the reflector surface (which you provide) through the horn-feed (described by Howard) through the multi-stage LNA and then through a complete build-it-yourself professional grade receiver. Less the parabolic reflector, you can duplicate the Howard Terminal receiving package using state-of-the-art brand new parts for less than $1,000.

The Coleman Terminal produces high quality pictures; but not perfect. The original Coleman Terminal produced satellite television for around $200 of Coleman's money. You start out with 'surplus' (as in used) equipment, modify it slightly, plug it all together and you are in the satellite TV reception business. The **COLEMAN TERMINAL MANUAL** shows you how, step by step, including constructing your ultra-low-noise GaAs-FET TVRO LNA! With 'the Coleman approach' you start off for small change and improve your system step by step as your desire and finances dictate.

The HOWARD TERMINAL MANUAL is priced at $30 from STT. The COLEMAN TERMINAL MANUAL is also priced at $30. **And** - you can have both manuals, together, as the perfect complimentary package of the 'cheap' and 'the clean' approaches to low cost satellite TV reception for the special STT package price of $50 (in U.S. and Canada; outside add $5 **per manual** for airmail service).

SATELLITE TELEVISION TECHNOLOGY
P.O. BOX G
ARCADIA, OK 73007 (405-396-2574)

SPEND 8 HOURS WITH H. PAUL SHUCH



H. PAUL SHUCH will give you an important 'leg-up' on microwave and satellite TV technology. In eight lectures (originally conducted for SPTS '79) he takes you through TVRO (1) Antenna and LNA Selection, **(2)** Superheterodyne Down Conversion Techniques, **(3)** Modular Receiver Design Approach, **(4)** Scattering Parameters, **(5)** Analytic Amplifier Design, **(6)** TVRO Test Equipment and Procedures, **(7)** Baseband Processing Systems, **and, (8)** TVRO System Summary. **This eight-lecture series is the perfect learning tool for teaching yourself, your class or your employees all about the basics of satellite TV reception techniques!**

The Shuch Satellite Symposium videotape series is available on VHS (LP) or BETA (BETA-2) format videotapes in a learning package. Paul Shuch is a frequent contributor to many microwave publications including the Proceedings of the IEEE. This eight-lecture series was videotaped live before the SPTS '79 overflow crowd in Oklahoma City this past August. Paul has an easy going, down-to-earth manner to carefully guide even the most inexperienced microwave hand through the complexities of microwave based satellite TV reception system design. There is no finer, or easier method of learning what you and your people need to know about the world of microwave TV reception. Order your special SHUCH SATELLITE SYMPOSIUM set of videotapes today.

_____ **SEND US THE LECTURE SERIES ON VHS** (LP) color videotape. Our check for $210 is enclosed (add $10 in Canada, Mexico; $25 elsewhere).

_____ **SEND US THE 8 LECTURE SERIES ON BETA** (BETA-2) color videotape. Our check for $225 is enclosed (add $10 in Canada, Mexico; $25 elsewhere).

NAME _____

COMPANY / SCHOOL (if any) _____

ADDRESS _____

TOWN / CITY _____ STATE _____ ZIP _____

Enclose payment with order to:

SATELLITE TELEVISION TECHNOLOGY
P.O. Box G
Arcadia, Oklahoma 73007

H. PAUL SHUCH
Satellite Symposium
Lecture Series
Videotapes Are
A Product of
STT
Satellite Television Technology

INSIDE THIS ISSUE

Oliver Swan's Good Fortune With
SPHERICAL ANTENNAS FOR SATELLITES

A Basic Course In Antennas
COMPARISON - PARABOLIC DESIGNS

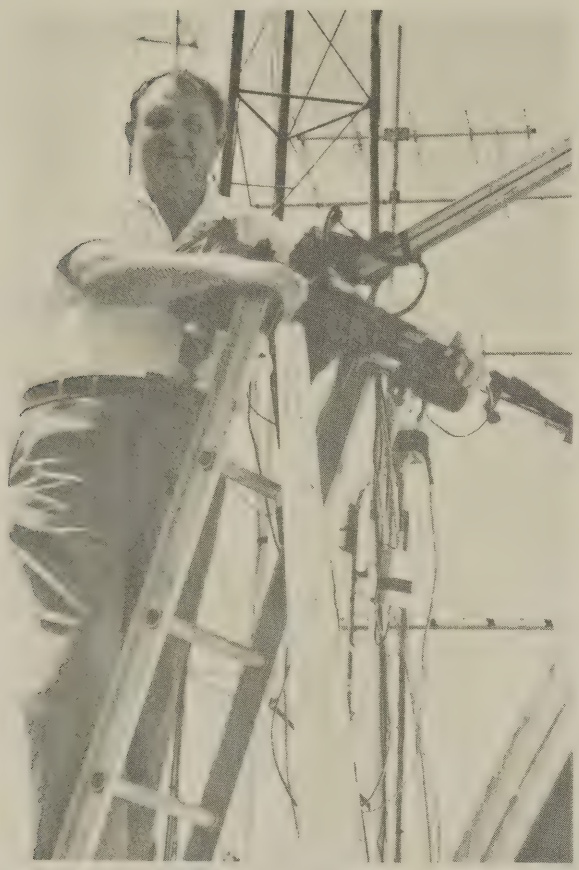
The Russian Birds Are Coming
RUSSIA'S EXPANDING GLOBAL 4 Gc NET

Ready Or Not . . .
UPDATE - FCC TVRO LICENSING

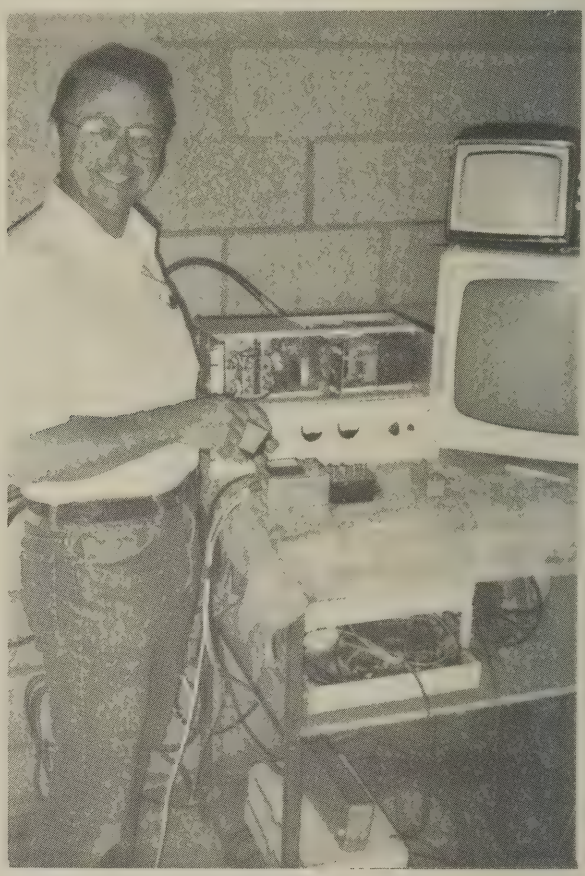
COOP'S SATELLITE DIGEST

NOVEMBER 1979

INTRODUCING....



MR. CHEAP



MR. CLEAN

Robert M. Coleman of Travelers Rest, S.C. has been dubbed 'Mr. Cheap' because his approach to designing and building low-cost TVRO terminals is bottom line slanted. H. Taylor Howard of Stanford University, on the other hand, wants every electron in place and every cable harnessed. So we call him 'Mr. Clean'.

The Howard Terminal produces perfect pictures. Featuring a Howard designed and tested bi-polar LNA package, a Howard conceived fully frequency-agile 24 channel tuneable receiver (with selectable audio sub-carriers) the **HOWARD TERMINAL MANUAL** leads you gently from the reflector surface (which you provide) through the horn-feed (described by Howard) through the multi-stage LNA and then through a complete build-it-yourself professional grade receiver. Less the parabolic reflector, you can duplicate the Howard Terminal receiving package using state-of-the-art brand new parts for less than $1,000.

The Coleman Terminal produces high quality pictures; but not perfect. The original Coleman Terminal produced satellite television for around $200 of Coleman's money. You start out with 'surplus' (as in used) equipment, modify it slightly, plug it all together and you are in the satellite TV reception business. The **COLEMAN TERMINAL MANUAL** shows you how, step by step, including constructing your ultra-low-noise GaAs-FET TVRO LNA! With 'the Coleman approach' you start off for small change and improve your system step by step as your desire and finances dictate.

The HOWARD TERMINAL MANUAL is priced at $30 from STT. The COLEMAN TERMINAL MANUAL is also priced at $30. **And** - you can have both manuals, together, as the perfect complimentary package of the 'cheap' and 'the clean' approaches to low cost satellite TV reception for the special STT package price of $50 (in U.S. and Canada; outside add $5 **per manual** for airmail service).

SATELLITE TELEVISION TECHNOLOGY
P.O. BOX G
ARCADIA, OK 73007 (405-396-2574)

COOP'S COMMENT ON TECHNOLOGY

FCC DOES IT!

On October 18th in a 25 minute session the Federal Communications Commission in a unaminous vote determined that from this point forward anyone installing a satellite (television, audio, etc.) **receive** (only) terminal should have the option of either (1) getting it licensed, or, (2) **not** getting it licensed. The decision creates a framework for the immediate growth of satellite television reception services.

The impact of the decision may be several months in coming however. The Commission directed the staff to work out the procedures for "registering" satellite receive-only terminals; the registration procedure will be the process installers will follow if they 'opt' not to go through the full licensing routine. Just what information will be required in the registration process, when you will register, and what rights (if indeed any) go with a 'registered terminal' all remains to be worked out by the staff. One would expect this process to take a minimum of 30 days and more likely 60 to 90 days before all of the puzzle pieces are in place.

CSD reader and satellite enthusiast **Paul Fox**, who lives in the Washington, D.C. area, attended the FCC session and was extremely fortunate to arrange for a videotaping of the historic meeting. After Coop has received the videotape of the meeting and has carefully reviewed everything said by the Commissioners and staff, we'll have a more detailed report (in the December issue of CSD). Those with terminals up and running can look forward to seeing this videotape on Coop's SATELLITE MAGAZINE program sometime in December.

Does this mean that **anyone** can now install a terminal, on their own, **and start tuning in programming** from various satellites at will; without jeopardy from 'the law? Not yet. It simply means that you are, under this decision, no longer required to go through the FCC licensing procedure to **build** a terminal. **Operating the terminal** is still a different can of worms. Operating the terminal means that you watch what you receive. And to watch what you see, or can tune in, you still must have the written authority of the programming source on the bird(s). The subject of which program sources will and will not deal with you, on a private terminal basis, was discussed in some detail in the Programming Section of CSD in October. The facts remain the same; some (about 80%) of the program sources **will** authorize you to watch their programs. Some do it gratis, some want a fee and a few want big fees. Previous to the FCC decision the bird common carriers were precluded from authorizing you to watch their programs **until** you could prove you had an FCC license to build the receive-only terminal. Now with the FCC decision, you no longer need to prove that you have FCC authority although it **may be** necessary to prove tht you have 'registered' the terminal before they will grant you that authority. All of that should sort out in the next 30 to 90 days and we'll keep you advised here.

Just as soon as we think we know what format the registration process will take, CSD will publish a form for you to complete in registering your own terminal. In the interim, sit tight. Breathe a sigh of relief that the big hurdle is now past. And start thinking about all of that good satellite video you will soon be enjoying; legally!

NEXT UP

By its action, the FCC in effect gives the green light to numerous large, competitive, manufacturers who have been studying the satellite TV hardware field that **now** it is OK to jump in with both feet. We can expect, in the next six months, to see numerous firms with big wallets and great capabilities entering the satellite hardware field. This will increase the competitive nature of the hardware pricing, bring about innovative new terminal designs, and greatly increase the awareness of the man in the street that there is indeed something called satellite television.

For those firms already in this field, vertical integration is now taking place. Cliff Gardiner's firm, Gardiner Communication Corporation, in Houston, Texas has recently gone from being a pure distributor of hardware (buying component hardware parts from firms such as Microdyne, AFC, SCI, etc.) to the posture of manufacturer. Cliff has done this by [1]purchasing a relatively small parabolic antenna manufacturer in Florida called Green Associates (they have a five meter fiberglass antenna), [2]negotiating on a royalty basis production rights for the Swan line of Spherical antennas (see story in Programming Section this issue), and [3] agreeing to purchase the satellite electronics portion of Scientific Communications, Inc. (SCI). The last 'deal' is the most significant one since SCI's line of LNAs and satellite (video and audio) receivers will become part of Cliff's Houston production operation.

This places Gardiner in a position to deal effectively with the full service offering of Scientific Atlanta, for example, where virtually everything that goes into a terminal is produced 'in house'. It also gives Gardiner a way to better control his own contract terminal installations; depending upon outside suppliers such as Microdyne and AFC, who themselves sell 'turnkey systems' direct, for hardware has been tricky at best since anyone who sells direct is always going to take care of their own direct customers first. And if the direct customers eat up the full production capabilities, that leaves a distributor such as Gardiner in a tough spot.

We wish Cliff well with his much larger operation. The competition he will bring into the marketplace will be good for us all.

CSD TECHNOLOGY

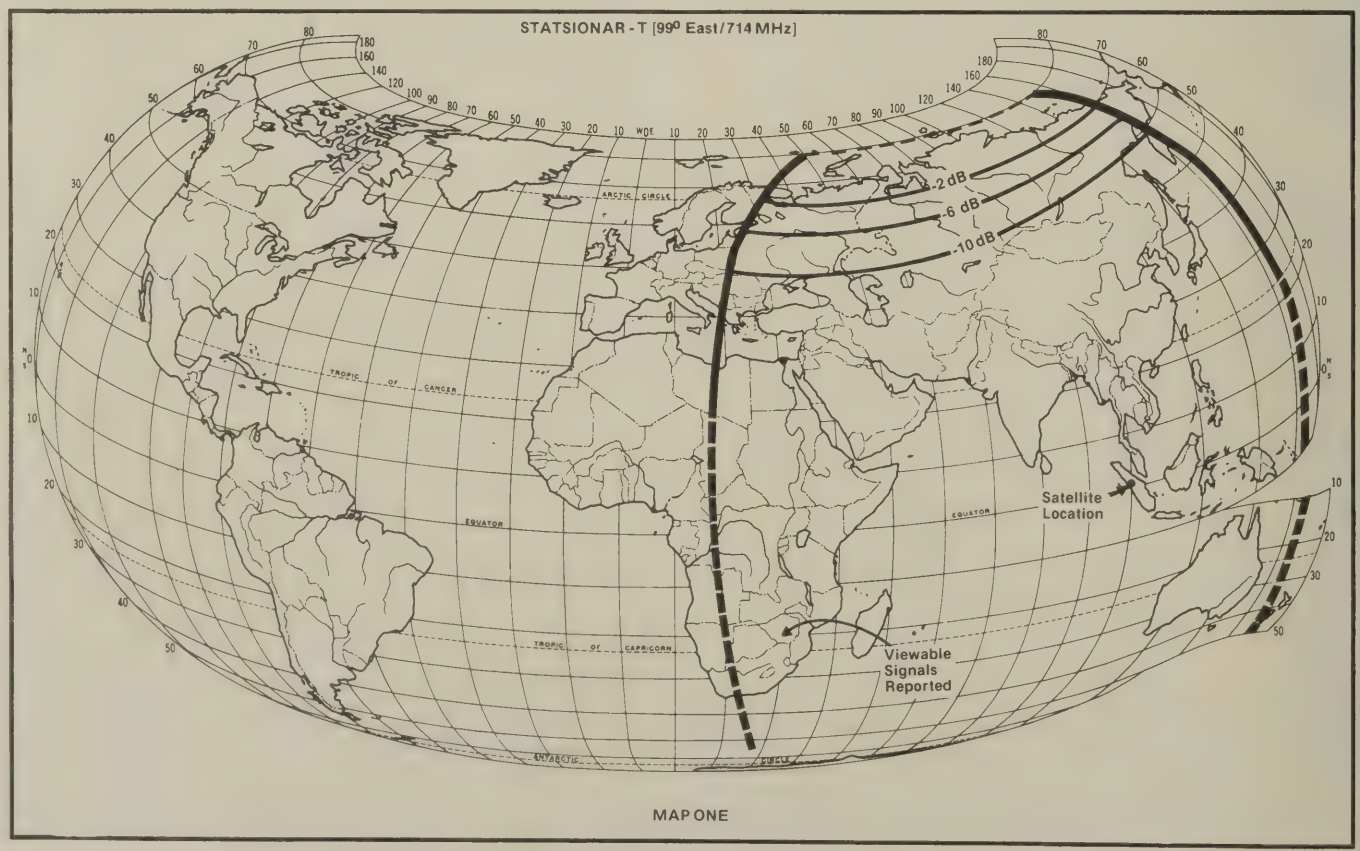
COOP'S SATELLITE DIGEST (Technology Edition) is produced monthly by Satellite Television Technology, P.O. Box G, Arcadia, Oklahoma 73007 (405-396-2574). CSD is available in two separate editions (Technology and Programming) or as a combined subscription. Subscription rates are $30 per year for first class mail delivery within U.S.A. or Canada for either edition, or $50 per year for the combined editions. Outside U.S.A. add $25.00 per year for any subscription. All subscriptions to be paid in advance in U.S. funds drawn on a U.S. bank; no invoicing. Contents are copyright 1979© by Satellite Television Technology and any duplication or reproduction in any form without written permission is a violation of Federal Statue (17 USC 101 et seq.).

RUSSIA'S GLOBE CIRCLING 4GHz SATELLITES

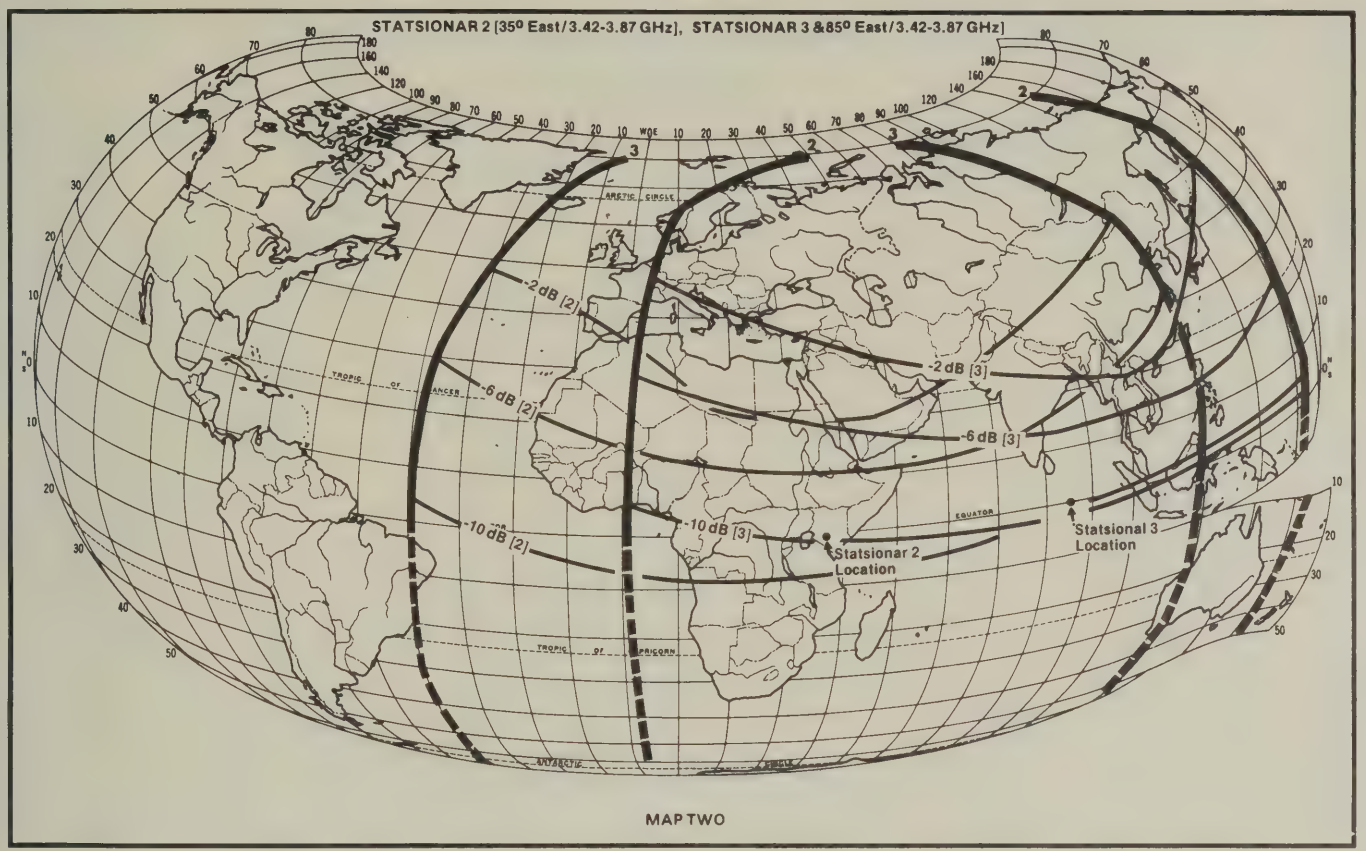
A CONGESTED ORBIT BELT

The final results of the current World Administrative Radio Conference (WARC) not to the contrary, a battle for supremacy in the geostationary orbit belt is beginning to shape up as the 'skylanes' fill up to near capacity in some portions of the world; in the 4 GHz downlink or C band service. Not to be outdone by INTELSAT (the international consortium owning and operating transponders for hire) nor to be outdone by the U.S. efforts to place American designed and constructed satellites into key orbit positions for regional and domestic service (before the orbit belt fills up), the Russians have been quietly but steadily involved in a massive world-girdling program to bring Russian originated television and communications to virtually any point on the globe. There is some considerable potential for conflict here, between Russian C band birds and those now operating or planned by INTELSAT and even some domestic systems. Here is what it is all about.

In 1976 the Russians began construction on a geostationary satellite system. Prior Russian systems had largely been employing the inclined orbit approach (see **CATJ** for January 1979, pages 38 to 40-A). Inclined orbit (Russian) birds have an apogee of around 40,000 kilometers and a perigee of only 540 kilometers. During apogee the bird hangs in a '**almost** stationary position' for a period of about 8 hours length, then the bird rapidly sweeps down towards perigee and returns to the apogee area some 4 hours later. The birds are in an inclined orbit of approximately 63.5 degrees in this motion. This system suits many Russian needs better than a true geostationary orbit because the combination of the inclined orbit plus the apogee height allows the birds to 'see' **over the top** of the North Pole (geostationary birds are cut off from visibility for any area north of approximately 80 degrees) and in fact down the opposite 'side'. Direct relay from Moscow to Cuba in 'one hop' is for example practical with this system.



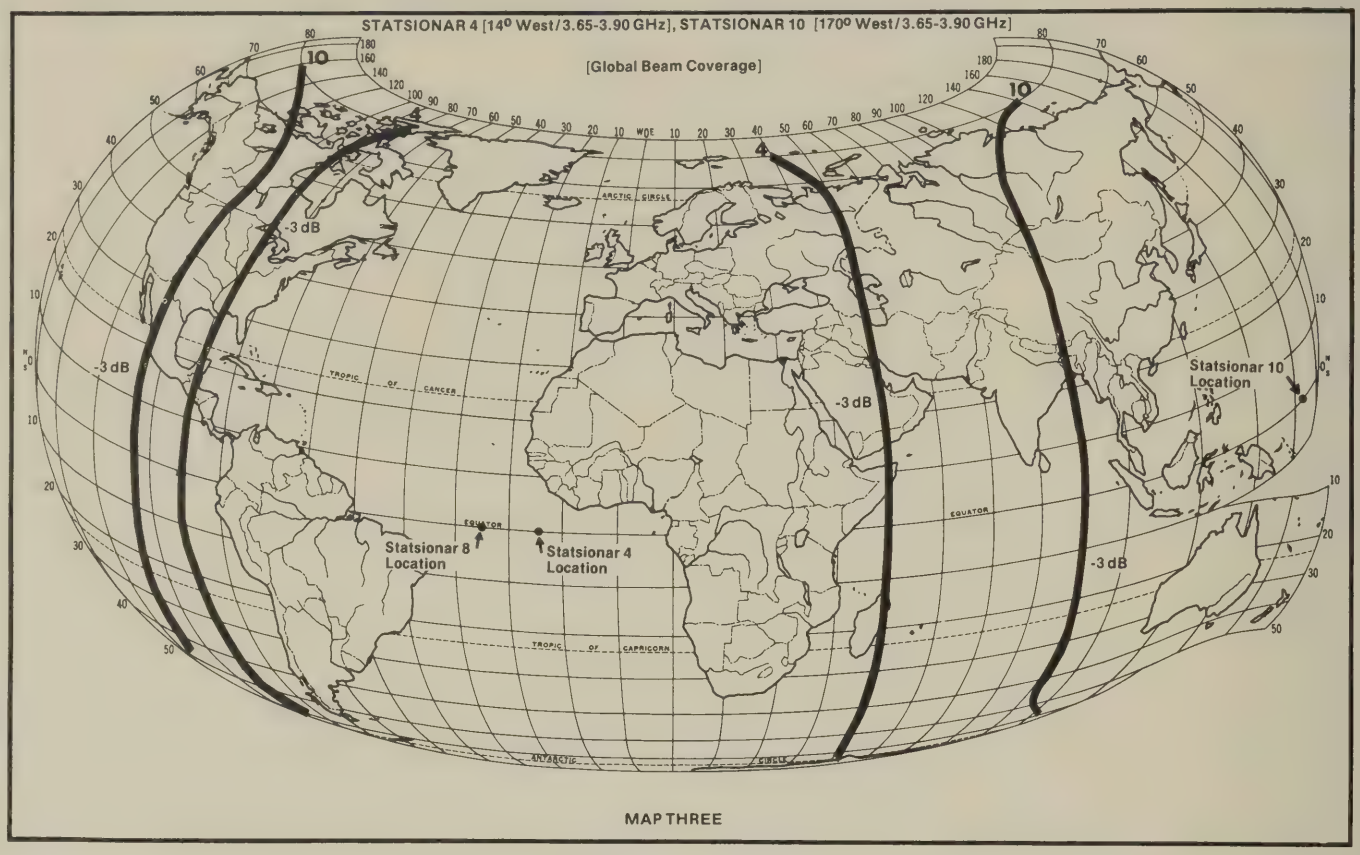
MAP ONE



MAP TWO

The Russian entry into the geostationary world began with orbit slots picked over the Indian Ocean. Statsionar T, located at 99 degrees east (see map number one) is actually a UHF (downlink band) bird with a center frequency of 714 MHz. With a 200 watt (output) transponder and a 90 element helical antenna the system has an EIRP of 56.5 dBw at boresight. Some indication of the antenna pattern can be seen in map number one. There is some reason however to believe that the antenna pattern may not be nearly as well defined as the Russians indicate on this map; Rhodesian experimenters report reception of a viewable nature even though they would be (by extrapolation) at least 20 dB down from the boresight center of the pattern. A receiving terminal located in the far western portions of Alaska would be within range (i.e. the bird would be above the horizon). Anchorage has a horizon cut off of 139 degrees east; Honolulu loses its horizon to the west at 122 degrees east. At other (reader) locations, such as Papua, New Guinea the Statsionar T bird would be 34 degrees above the horizon. The Russian receiving systems operating with Statsionar T are typically rooftop yagi (linear polarized although the bird transmits circular and a circular or helix receiving antenna would gain 3 more dB) and simply UHF or VHF downconverters. The intended and regular use of this service is to provide direct Moscow television to the area east of the Ural mountains, and on into Siberia.

So far there is no 'conflict' with the worldwide explosion in C band (4 GHz) geostationary satellites. Next up however was the Statsionar-2 bird which is located at 35 degrees east and Statsionar-3 located at 85 degrees east. This particular Russian satellite family is reported to have an EIRP of 29 dBw in a (northern) hemispheric beam in the (roughly) 3.4 to 3.9 GHz region. Note that INTELSAT and other (including U.S.) domestic system birds operate in the 3.7 to 4.2 GHz downlink region; and that the Russian birds 'share' a 200 MHz portion of the otherwise common spectrum between 3.7 and 3.9 GHz. Statsionar-2 is intended to provide radio, telephone, telegrams and video between the European portions of Russia and the western USSR. Statsionar-3 has similar capacity except that it has a secondary purpose of providing Moscow television to the Kamchatka peninsula just north of Japan. (Note that some sources place Statsionar-3 at 80 degrees east rather than the 85 degrees noted here; Russian released coverage maps for 2 and 3 appear here.) The 85 (or 80) east location of 3 is still not of much interest to North American based receive terminals since it is 'over the horizon' for anyplace in North America. The 35 degree east location is just beyond the horizon for many of



MAP THREE

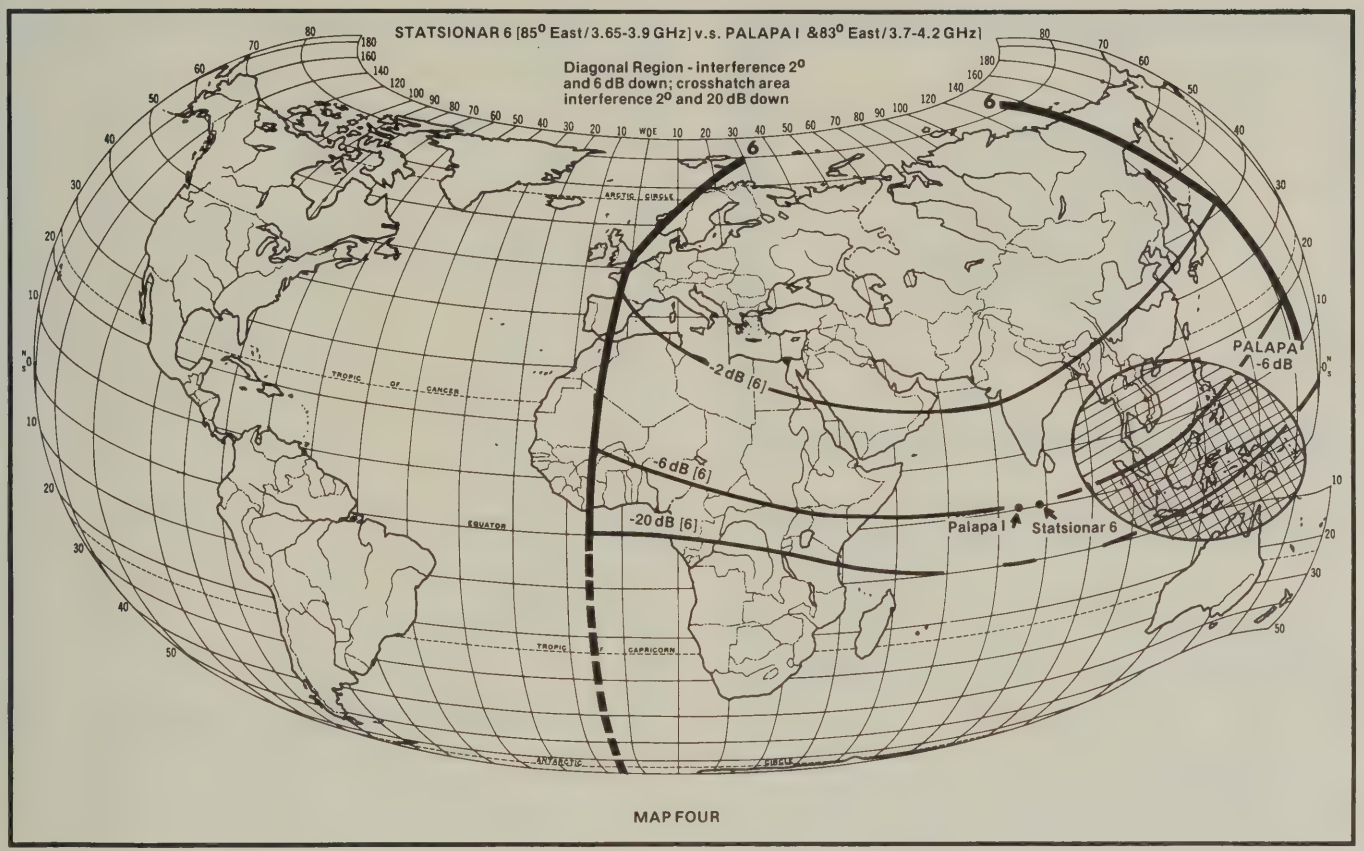
the more eastern North American locations (the horizon stops at a geostationary orbit position of 14 degrees east for Bermuda, Caracas, and San Juan; at 17 degrees east for Sydney, Nova Scotia). But the Russians have more birds on the drawing boards and some of these will be much closer to North America.

When the Statsionar series is finished by 1981, the Russians plan to have 9 operating satellites in geostationary orbit. Statsionar 4 through 10 will be operating more or less in the 4 GHz band while Loutch 1-4 will be the first 14 GHz uplink and 11 GHz downlink birds of Russian design. Note in table one that the Russian uplinks and downlinks (where specified precisely) vary considerably from bird to bird or area to area; the Russian 'technique' for squeezing in their own satellites in geostationary orbit positions where normalized operation in the 3.7 to 4.2 downlink band would create potential interference for existing INTELSAT and/or domestic satellites.

Also keep in mind that any satellite designer has the option of providing (1) global coverage (i.e. the bird's transmit antennas "see" approximately 40% of the earth, in all directions simultaneously, as far as the horizon), (2) hemispheric coverage (typically in INTELSAT hemispheric coverage is defined as 'north' or 'south' although in theory it could also be 'east' or 'west'; think of hemispheric coverage as a portion or chunk of the global coverage possible), and, (3) 'shaped beam' coverage such as our own domestic satellites provide. Much of the INTELSAT operation is in the hemispheric mode although by ground commands the satellites can be switched to global or 'shaped/spot beam' coverage at will.

Of primary interest to North and South American area viewers will be the operation of **Statsionar-4 at 14 degrees west** (above the horizon as far **west** as a line drawn north and south between Chicago and New Orleans) and **Statsionar-10 at 170 degrees west** (above the horizon as far **east** as a line drawn between Billings and El Paso. Both of these birds will be operating with Global patterns and if indeed the power level is in the 29 dBw region locations such as Miami (Statsionar-4 will be 14 degrees up), Boston (Statsionar-4 will be 15 degrees up), Los Angeles (Statsionar-10 will be 23 degrees up) and Anchorage (where 10 will be 19 degrees above the horizon) all look 'do-able.' Note that Russian sources indicate both 4 and 10 will be operating in the 3.65 to 3.9 GHz downlink region. Statsionar-4 is scheduled to be up at about the time you read this; 10 is not due up until mid-1980.

There is yet another Statsionar bird of interest; particularly to the eastern two-thirds of the North American region. That is bird number 8 which is


STATSIONAR 6 [85° East/3.65-3.9 GHz] v.s. PALAPA I &83° East/3.7-4.2 GHz]
Diagonal Region - interference 2° and 6 dB down; crosshatch area interference 2° and 20 dB down
6
-2 dB [6]
-6 dB [6]
-20 dB [6]
PALAPA I -6 dB
Palapa I
Statsionar 6
ARCTIC CIRCLE
TROPIC OF CANCER
EQUATOR
TROPIC OF CAPRICORN
ANTARCTIC CIRCLE

MAP FOUR

scheduled for a 1980 launch to an orbit position of 25 degrees west. Officially, Statsionar-8 is a standby or reserve bird for Statsionar-4. However by being another 11 degrees further to the west, it moves the possible reception zone well into the mid-lands of the U.S.A. and Canada. For example, in Chicago the 4 elevation is but 3 degrees while 8 will be 12 degrees up. Houston loses out on 4 but will find 8 a manageable 8 degrees above the horizon. Winnipeg also loses on 4 but could scrape by with 8 at a 3 degree elevation (if the system installer was careful to shroud against terrestrial noise!). Toronto will find 8 a big 17 degrees up, Kansas City will find it at 7 degrees elevation and back in Miami the shift to 8 brings Statsionar 8 in at 23 degrees above the horizon.

Statsionar-6 is another interesting bird even if it is out of reach except for the Pacific Islands; at 85 degrees east. The transmitting downlink in the 3.65 to 3.90 GHz region (the bird is scheduled for life in mid-1980) will be fed into a **pair** of antennas; one shaped for most of Europe, the western part of the USSR and the northern portion of the middle east. The second downlink transmit antenna will be shaped for the northern half of Africa as well as the bulk of the USSR. The **uplink** system (6.0 to 6.25 GHz) will employ non-directional **receiving** antenna arrays so that in fact it is a 'global pattern' uplink system. Input signals can access the bird from as far west as central Africa, as far east as Australia, and from 80 degrees north to 80 degrees south. The Russians, in print, have taken note of the presence of the Indonesian Palapa series satellites; Palapa I is positioned at **83** degrees east. The Palapa system is using a shaped or spot beam approach designed to cover the Pacific Basin countries in a circle roughly 2000 miles in radius centered on Jakarta. The two degree separation between the two birds should present no real problems for the **downlink** users since the Statsionar-6 bird will be boresighting on Europe and Asia while Palapa is looking almost directly down. The uplinks may however conflict and for the most part it is likely to be the Russian bird that suffers with the omni-directional uplink receiving antenna pattern that is global coverage in design. The Russians have been quoted as saying "mutual interference cannot be avoided".

ANTENNA COMPARISONS

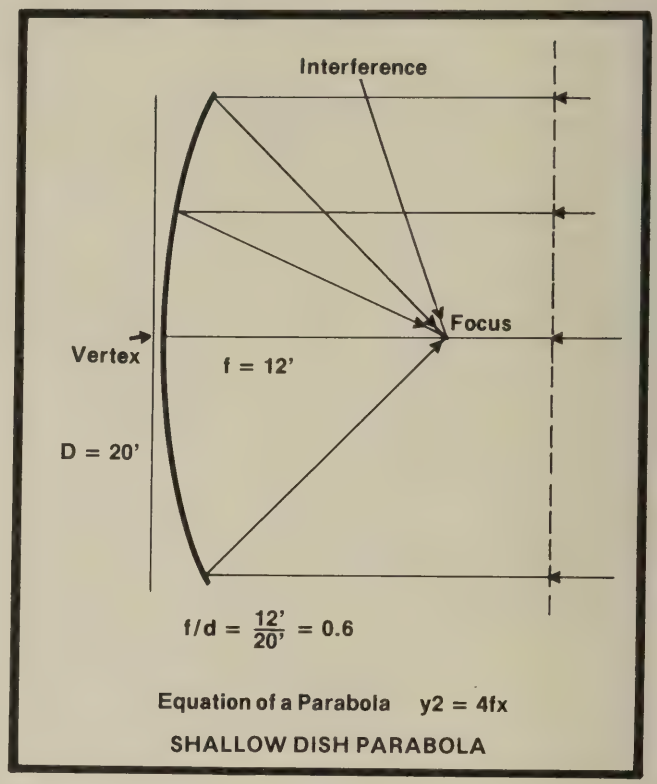
As this issue's story on the Oliver Swan Spherical TVRO antenna status notes, there are several approaches to effective TVRO antenna design available to the designer/builder. The Swan Spherical is of course the newest of these techniques. Older techniques, in use for several decades in one form or another, are more 'classical' in design coming as they often do straight from the antenna textbooks. (**Note** - Perhaps the most useful antenna textbook around is appropriately titled **Antenna**

SMALL TERMINAL ANTENNA NOTES

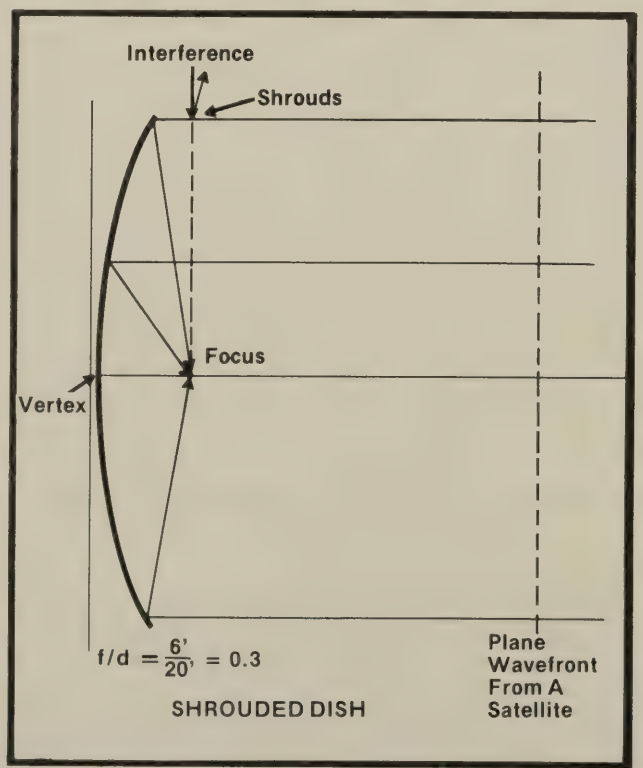
Engineering Handbook; the author is Henry Jasik, the publisher is McGraw-Hill Book Company and any good book store can order a copy for you. Price is in the $30 range at last check.)

Several years ago when the cable TV industry was first becoming acquainted with the satellite TV reception field an engineer at RF Systems, Inc. prepared a detailed talk on antenna designs and what each one had to offer to the ultimate user. The material presented here comes from that forum and is presented in the hopes that by graphically portraying the various antenna options available the antenna designer-to-be will be better acquainted with both the options available and the design trade offs involved with each option.

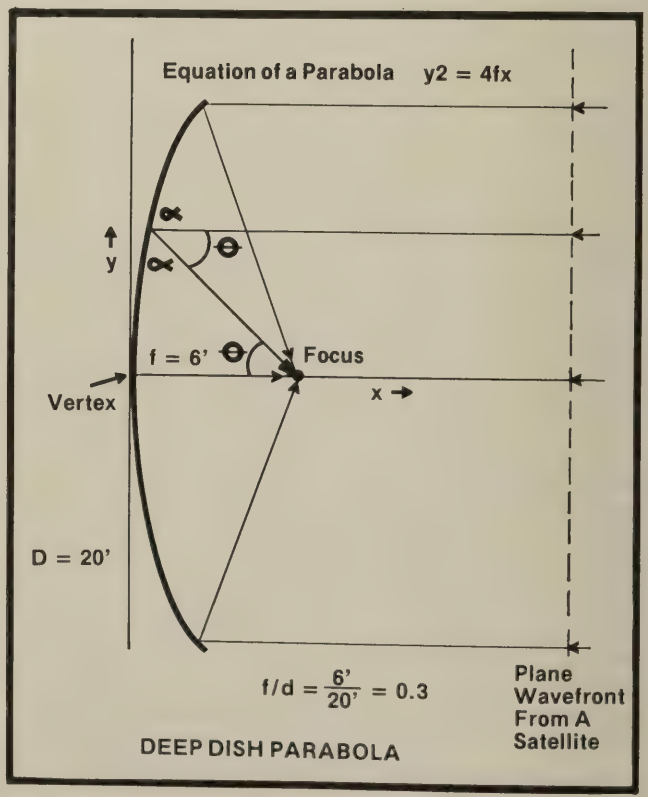
For those who do not have the 'luxury' of designing the antenna surface from scratch, but must work with someone else's design by virtue of having located a 'surplus' antenna reflector surface, the material appearing here in box form should be useful. Given two knowns (the antenna Radius, and the physical depth of the antenna) you can then proceed to calculate the f/d of the particular antenna you have located.



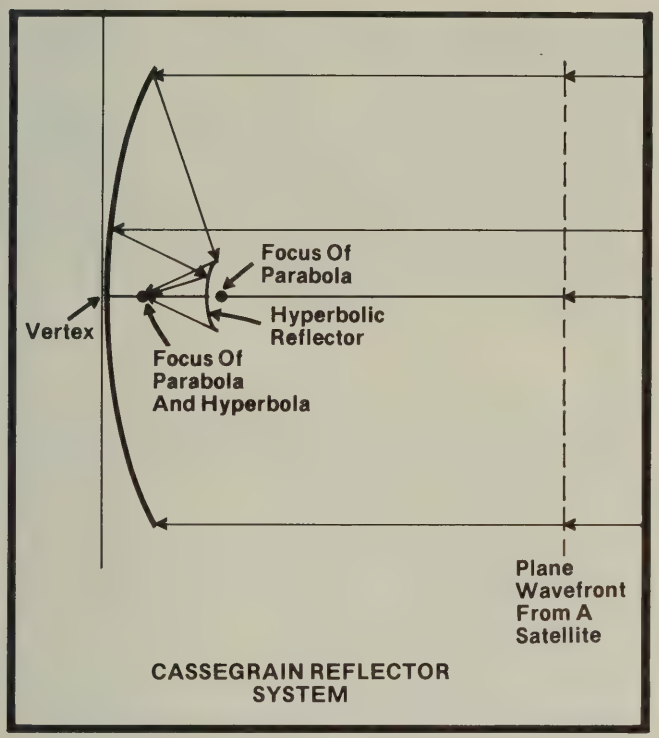
SHALLOW DISH PARABOLA



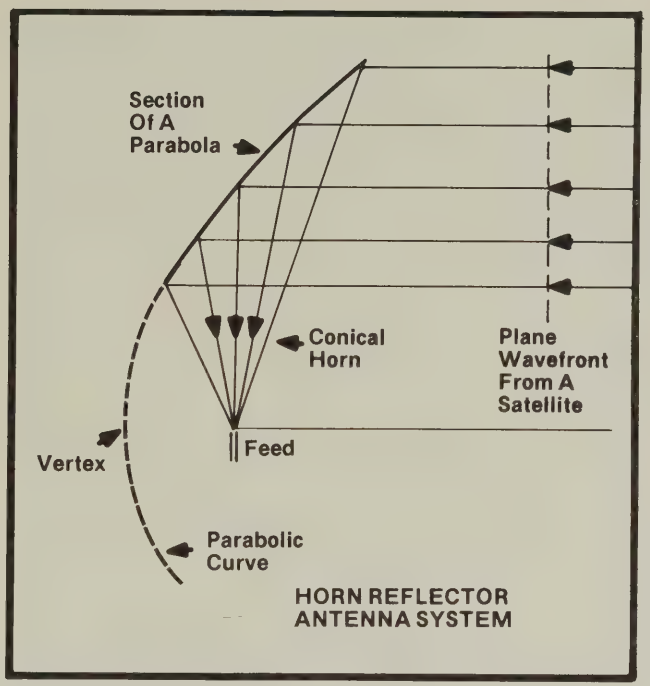
SHROUDED DISH



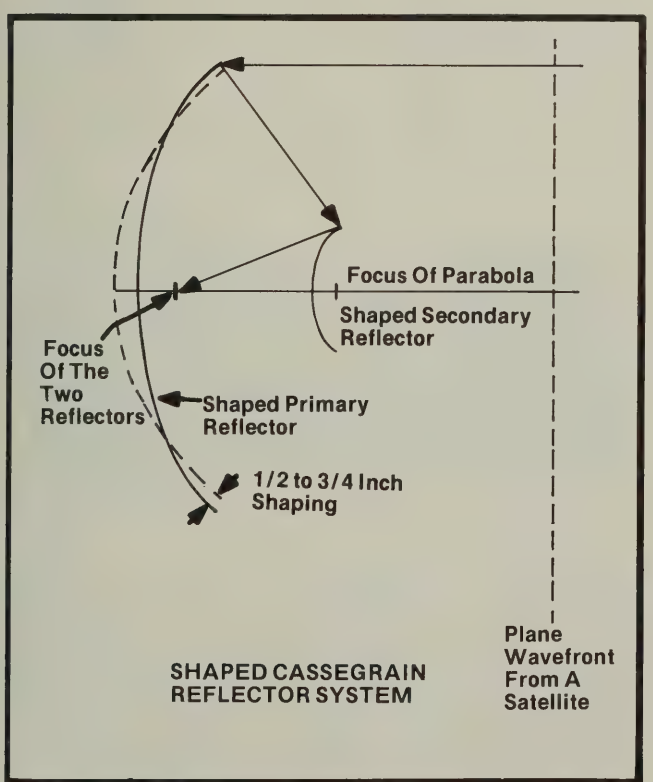
DEEP DISH PARABOLA



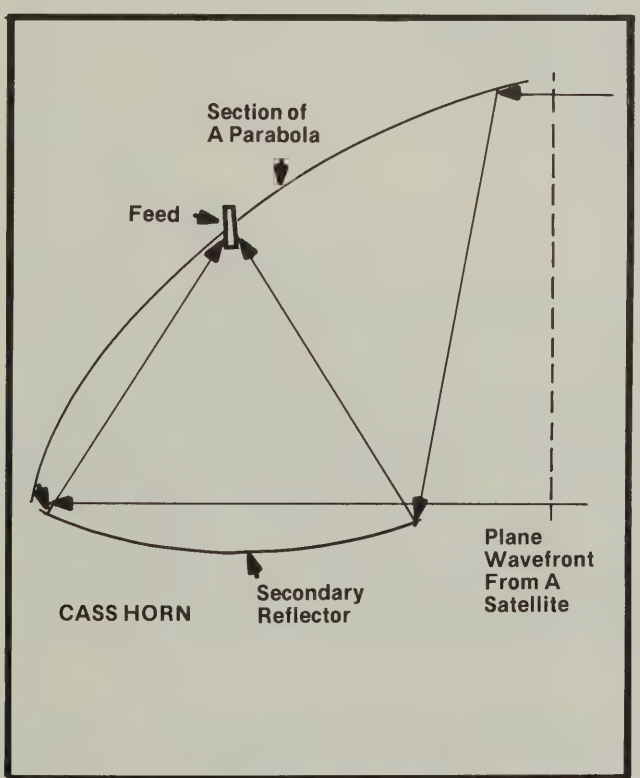
CASSEGRAIN REFLECTOR SYSTEM



HORN REFLECTOR ANTENNA SYSTEM


Focus Of Parabola
Shaped Secondary Reflector
Focus Of The Two Reflectors
Shaped Primary Reflector
1/2 to 3/4 Inch Shaping
Plane Wavefront From A Satellite

SHAPED CASSEGRAIN REFLECTOR SYSTEM



CASS HORN

CALCULATING f/d

1]Measure A1-B1 to determine radius.

2]"Halve" the A1 to A2 measurement [i.e. C1 point] and measure at a right angle from C1 to B1 [reflector surface at deepest point].

3]Focal length [f1] is equal to $f1 = \frac{[A1 \text{ to } B1]2}{4\,[x]\,C1 \text{ to } B1}$

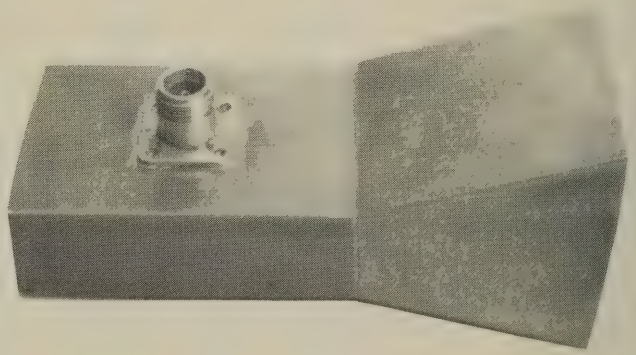
THE COMPONENTS SCENE

SURPLUS WAVEGUIDE/FLANGES

Waveguide components are a necessary evil for design and construction of TVRO terminals on a private basis. You might get away without any of the plumbing, but it certainly is easier to get into and out of antenna feed horns and the like if you have the appropriate flange!

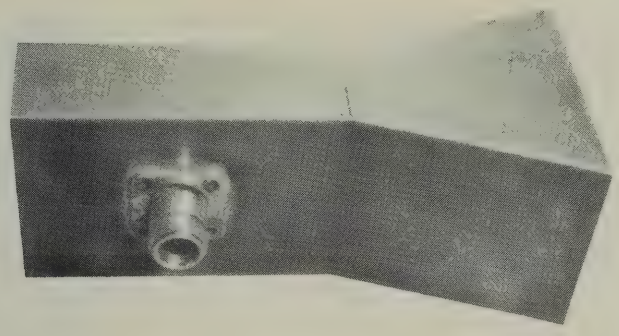
A waveguide is a section of transmission line. Only it **typically** has physical measurements which restrict its use to only a portion of the microwave spectrum. The same thing is true with waveguide flanges and fittings. Operating a system in the 3.7 to 4.2 GHz range with a flange designed to pass only microwave signals from say 7 to 11 GHz (i.e.WR-102)will result in very poor (if indeed any!) performance in the 3.7 to 4.2 GHz range. The physical size of the waveguide in this example is simply not large enough to propagate the 'longer' wavelengths in the 4 GHz region.

New waveguide and fittings are expensive. One source, if money is no object, is **Lectronic Research Labs, Inc.** (Atlantic and Ferry Avenue, Camden, N.J. 08104; 609-541-4200). However on the surplus market, meaning at Hamfests, through telephone company disposal yards and anywhere old, dis-carded microwave gear gathers, you may stumble across fittings which can be pressed into service either as is or with some subtle modifications. An example of what can be done with a piece of waveguide is shown here; not in construction detail at this time because developer Robert Coleman is still analyzing the performance of the unit. However, Robert has



taken a piece of WR-229 waveguide (intended for the 4 GHz service), and he has split two sides to allow him to expand or flare the waveguide into a feed horn. The flared portion has been married to another piece of metal to form the 'V' shaped sides on the horn. In Robert Coleman's case, by having a box filled with surplus waveguide he had the basis for this feed horn already on hand and therein is the story; be prepared to shop for and collect surplus waveguide and flanges and fittings because if they are in the proper frequency range you can either use them as-is or turn them into a useful device.

CASSEGRAIN FEED SYSTEM employed in new fiberglass reflector surface system for Hughes commercial customers. Note hyperbolic sub-reflector and extremely long, tapered horn feed at sub-reflector focal point.



To help you select what is useful and what is not useful, here is a table of the commonly found waveguide components available on both the surplus and new equipment markets. Very seldom will you find the operating **frequency range** stamped or stenciled on the piece but almost always you **will find** the WR number type in place someplace.

WR Series Number	Frequency Range
WR-8	90 to 140 GHz
WR-12	60 to 90 GHz
WR-15	50 to 75 GHz
WR-28	26.5 to 40 GHz
WR-34	22 to 33 GHz
WR-42	18 to 26.5 GHz
WR-62	12.4 to 18 GHz
WR-75	10.0 to 15 GHz
WR-90	8.2 to 12.4 GHz
WR-102	7 to 11 GHz
WR-112	7.05 to 10 GHz
WR-137	5.85 to 8.2 GHz
WR-187	3.95 to 5.85 GHz (*)
WR-229	**3.3 to 4.9 GHz**
RG-109/U	2.6 to 3.95 GHz (*)
WR-284	2.6 to 3.95 GHz (*)
WR-340	2.2 to 3.3 GHz
WR-430	1.7 to 2.6 GHz
WR-650	1.12 to 1.7 GHz
WR-975	0.75 to 1.12 GHz
WR-2100	0.35 to 0.53 GHz

* - Some portion of the design frequency range overlaps with a portion of the 3.7 to 4.2 GHz band but this series will not properly cover the **full** band of interest.

MIL (military) Spec (specification) parts may have supplemental numbers in place of or in addition to the standard WR series numbers. A detailed list for all of the frequency bands available would not be a wise use of space. However, for the 3.7 to 4.2 GHz region, here are the applicable numbers:

MIL Type	Type Device	MIL Waveguide #	WR Series
UG-1350/U	Choke	RG-340/U	WR-229
UG-1351/U	Choke	RG-341/U	WR-229
UG-1726/U	Cover	RG-340/U	WR-229
UG-1727/U	Cover	RG-341/U	WR-229
RG-48/U	Waveguide	RG-48/U	WR-284
RG-49/U	Waveguide	RG-49/U	WR-187
RG-75/U	Waveguide	RG-75/U	WR-284
RG-95/U	Waveguide	RG-95/U	WR-187

In the WR-229 series, other than the basic waveguide, there has not been a long list of other 'attachment components' develop. What you are apt to find will be flange adapters (CMR-229/CPR-229F), 45 degree 'H' bends and 90 degree E bends, and flexible sections with a neoprene jacket from 12 to 24 inches in length.

PARTS SHORTAGES

A number of hard to second-source parts have become very difficult to obtain during the late summer and early fall. The explosion of interest in 3.7 to 4.2 GHz microwave technology at all levels is blamed by most suppliers who simply were not prepared for the onrush of purchasing interest.

One of the more critical items is Duroid circuit board. For those not aware, you do not print LNA or other 4 GHz circuits on G-10 board! The loss in this non-teflon board material will eat you up in circuit losses in a hurry. There are several sources for the right kind of circuit board around; 3-M has a board designed for microwave available but many people such as Taylor Howard recommend that you **not** use this 3-M product line because of past problems with it. The primary supplier is Duroid board is the **Rogers Corporation** (Box 700, Chandler, AZ 85224). Their Grade D-5880 226-127 with a thickness of 0.031 dielectric, clad 1 oz (two sided) has become the mainstay of many circuit board suppliers in this area (such as Robert Coleman). Lead times have stretched however to the point that orders placed today will show up in about 90 days time. Coleman and others report they are running behind in deliveries as a result of this delay.

Another critical item similarly impacted is the doubly balanced mixer which until now has largely been available (at a reasonable price) exclusively through **VARI-L** (3883 Monaco Highway, Denver, CO 80297). Lead times at VARI-L have also stretched to as much as 90 days from the date of order. A new second source, **not yet delivering** but promising to deliver shortly after the first of the year, is **Engelmann Microwave** (Skyline Drive, Montville, N.J. 07035). Engelmann has recently completed R and D on a new 3.7 to 4.2 GHz DBM package which they suggest they will be offering in the $65 to $75 price range (small quantities).

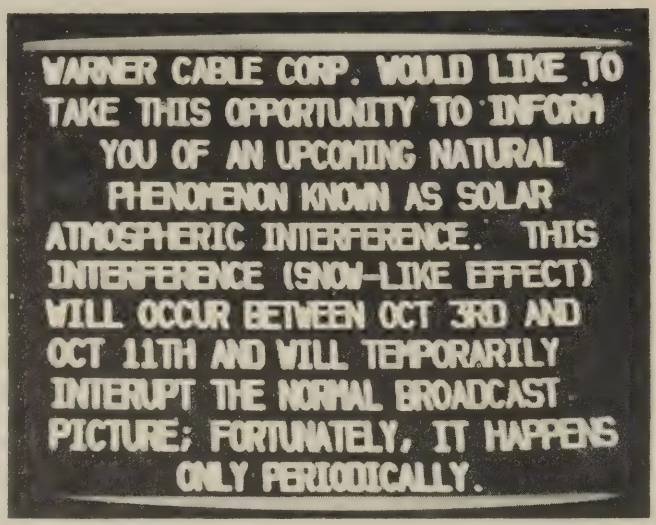
SMALL SYSTEM APPLICATIONS

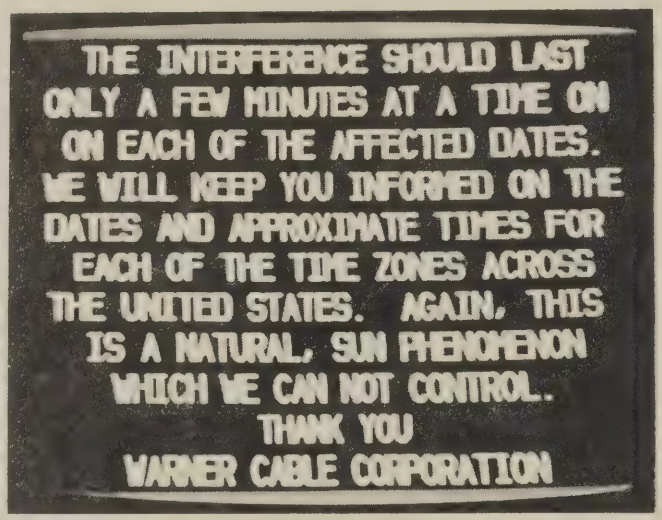
SUN OUTAGE

It happens during two periods each year. The Sun (our Sun!) aligns itself with the geostationary satellite your receiving terminal is pointed at and the full power output of the Sun, as a noise source, is received by your receiving system.

Fortunately the effects are short lived; thanks largely to (1) the beamwidth or pattern on your dish, and, (2) the peculiar celestrial mechanics that must be created to put the Sun **directly in line** (but behind by some 93,000,000 miles) the satellite of interest. The two periods of the year so impacted are plus or minus (typically) 20 days from the equinox (September 21st and March 21st) but because of the beamwidth of your antenna system the precise alignment required for the Sun's solar noise to interfere with the geostationary satellite signal typically lasts for less than 15 minutes time.

During this past October's Sun outage period we photographed the progression of the Sun outage on transponder 3 (WGN) as the Sun moved into alignment with FI, and then slowly crept out of alignment. In year's past we have


WARNER CABLE CORP. WOULD LIKE TO
TAKE THIS OPPORTUNITY TO INFORM
YOU OF AN UPCOMING NATURAL
PHENOMENON KNOWN AS SOLAR
ATMOSPHERIC INTERFERENCE. THIS
INTERFERENCE (SNOW-LIKE EFFECT)
WILL OCCUR BETWEEN OCT 3RD AND
OCT 11TH AND WILL TEMPORARILY
INTERUPT THE NORMAL BROADCAST
PICTURE; FORTUNATELY, IT HAPPENS
ONLY PERIODICALLY.


THE INTERFERENCE SHOULD LAST
ONLY A FEW MINUTES AT A TIME ON
ON EACH OF THE AFFECTED DATES.
WE WILL KEEP YOU INFORMED ON THE
DATES AND APPROXIMATE TIMES FOR
EACH OF THE TIME ZONES ACROSS
THE UNITED STATES. AGAIN, THIS
IS A NATURAL, SUN PHENOMENON
WHICH WE CAN NOT CONTROL.
THANK YOU
WARNER CABLE CORPORATION

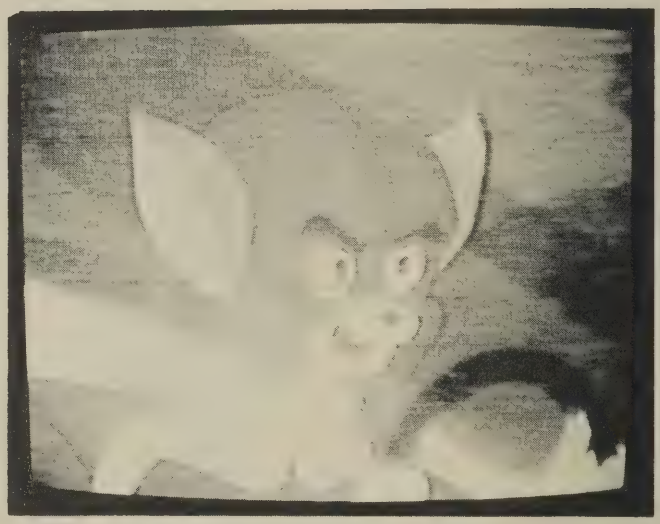
SOME SERVICES such as STAR CHANNEL advise viewers of the impending solar noise contest.

videotaped the event and even recorded it using a field strength meter driven by the 70 MHz output of the i.f. on our TVRO receiver.

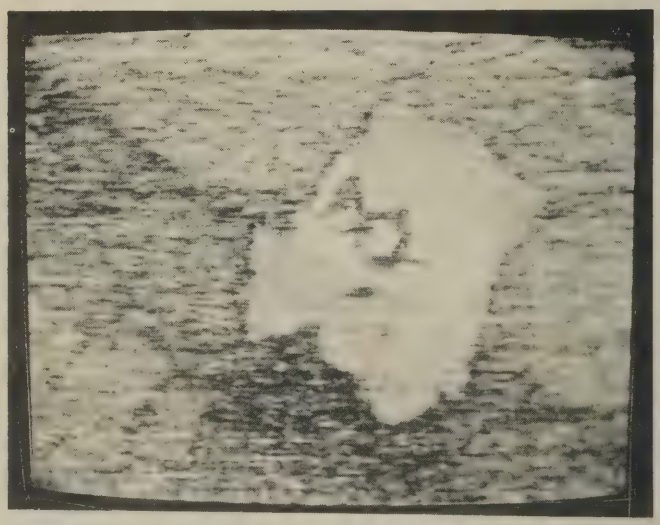
Some of the services have graduated to the point where they advise their viewers of the short term 'interference' but most services simply ignore the problem knowing that it will be the cable company (not them) that gets the calls. A typical outage will last from 3 to 15 minutes with ten foot or larger antennas (smaller antennas have wider front lobe beamwidths and therefore see the Sun longer). The date when the Sun's alignment was most nearly perfect for our Oklahoma location was October 8th and the time was just after 4 PM central time for FI. As you might suspect, since in the fall the Sun is moving slowly more southward in the sky with each progressing day locations in the southern U.S. see the Sun first and as the Sun moves south the more northerly locations have the brief interruption in service.

The visual effect of the Sun outage is for the normally crystal clear picture to slowly develop a case of the 'sparklies'. In approximately ½ of the total outage period (from the first hint of sparklies until the last hint) the interference reaches a peak. It has been observed that our 5 watt output transponders, coupled through 29 dB gain antennas on the bird

[1]

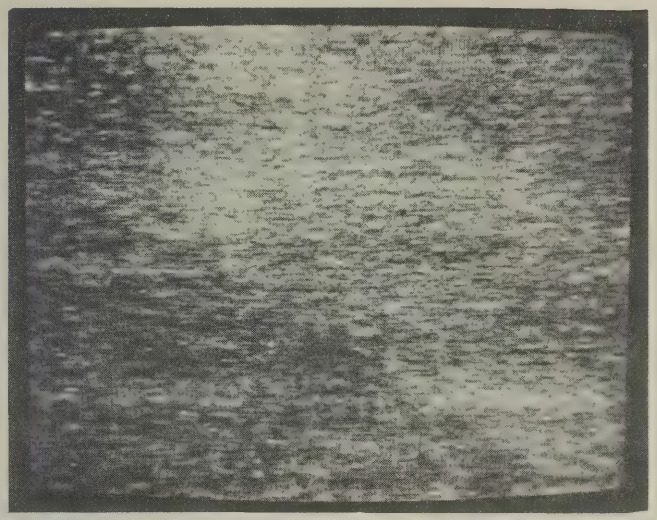


[2]



[3]

PROGRESSIVE wipe out of satellite signal is shown in this picture sequence. Service re-establishes in reverse order.

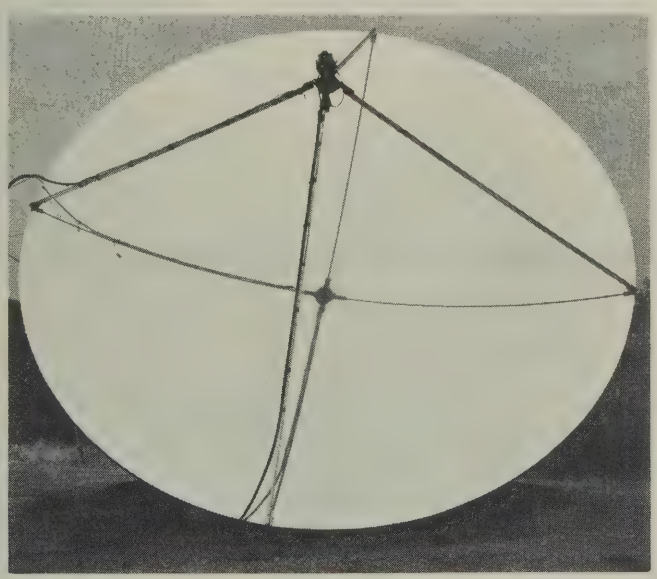


[4]

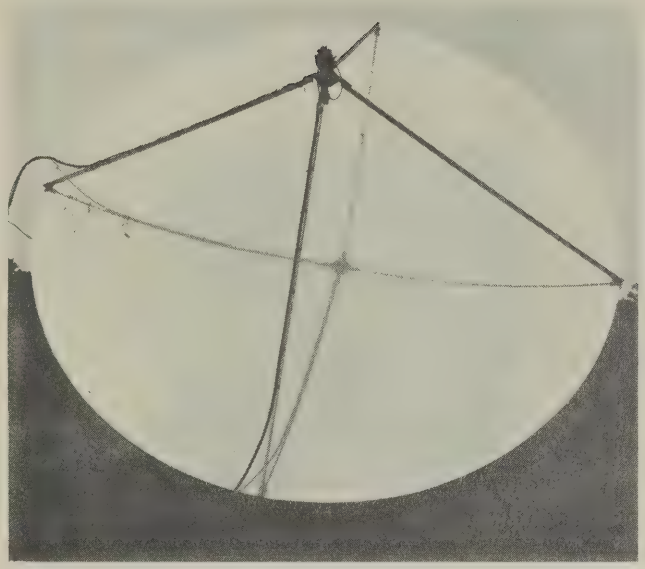
(at boresight) produce an effective radiated power that is **almost exactly equal to** the Sun's noise output in the same band at the same time. Which is another way of saying that the Sun's "signal" at 93,000,000 miles is equal in strength (as a wide band noise source) to the satellite's signal at 22,300 miles. As the photos here show, the extent of the 'wipe out' is almost complete at the point of peak interference.

Oh yes, you can tell when the solar outage is approaching your location if you have a prime focus feed on your antenna by checking on the path of the shadow made by the Sun with the prime focus feed. When the Sun exactly aligns with the satellite, your prime focus feed antenna is in turn aligned with the satellite and this causes the sun to cast a shadow of the prime focus feed system precisely in the center of the antenna reflector surface.

This is that twice-a-year point where your LNA had better be protected against heat build-up, and, your reflector surface had better have some type of light scattering paint in place.



WATCH YOUR REFLECTOR for alignment of the prime focus feed shadow with the precise center of your reflector surface; that's a sure sign the Sun is in line with the geostationary satellite.



You wouldn't want to 'cook' your LNA or feed electronics by allowing the sun to focus its output on the reflector surface and then re-focus to the feed point electronics!

SATELLITE 'Ham' NET

...meets Sunday at 1900 Z on 14.311 **or** 14.343 (latter frequency when 14.310 is busy with emergency phone patch traffic). Net control is either W5KHT (Coop), W5JG (Lindsey) or KA4BCF (Lib Coleman). Typical check-ins include Robert Coleman (K4AWB) for those working on TD-2 Conversion.

FOR YOUR EARTH STATION, CHOOSE

AVCOM'S PSR-3

SATELLITE VIDEO RECEIVER

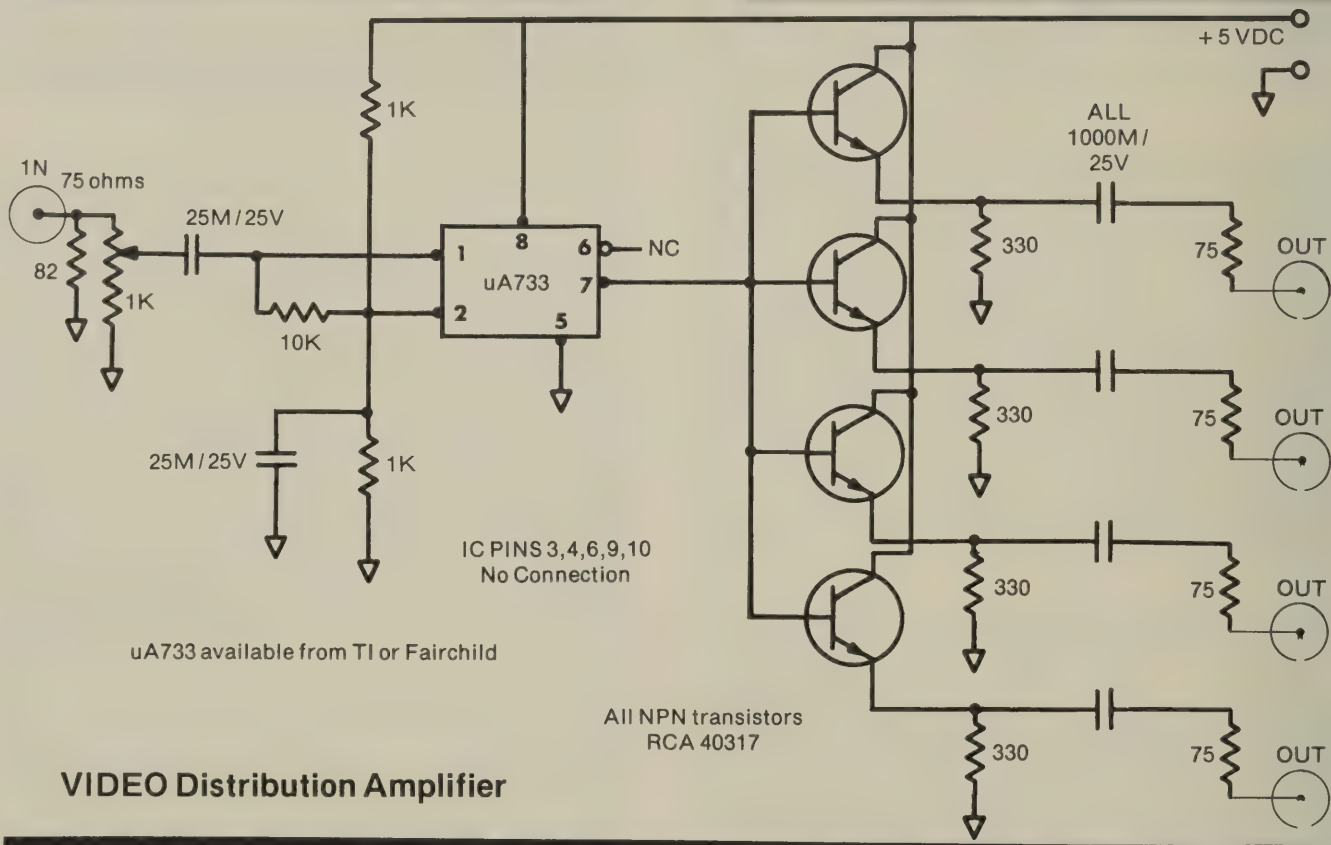
DESIGNED FOR YOUR PRIVATE TERMINAL

- Remote tuning
- Dual video outputs
- Exclusive Clamp-Sync & Scan-Tune
- Many other features!

AVCOM of Virginia, Inc.
10139 Apache Road, Richmond, VA 23235
(804)320-4439

BASEBAND INTERFACING UPDATE

cable subscribers
NOW! atlanta's CHANNEL 17
programmed in
TV GUIDE



VIDEO Distribution Amplifier

TECHNICAL CORRESPONDENCE AND NOTES

WRONG EVERYTHING...

To set the record straight on the item appearing on T16 (October CSD) concerning Ariane, which CSD describes as 'African based semi-private funded rocket launch system developed largely by German engineering and money...'. I believe you may be confusing the European Space Agency's Ariane system with the now defunct Otrag system. Ariane is a launcher with Atlas-Centaur capability produced by the governmental European Space Agency with the biggest participation by the French government. It will be launched from Kourou, which is in French Guyana, on the northeastern coast of South America. Otrag, on the other hand, is a somewhat mysterious organization that had been attempting to launch a rocket from a site in Zambia, until their prototype blew-up on the pad and the German government ordered them to cease activities in Europe. I feel sure my friends at the

European Spage Agency would be horrified to think they were being confused with Otrag.

Jonathan Miller
Managing Editor
Satellite Week
Washington, D.C. 20036

Jonathan is totally correct; which is something Jonathan usually is! The Otrag group was thought by some with a suspicious mind to be a 'cover operation' **that was really concealing some sort of German backed** (private) **effort to create for the group a worldwide rocketry base perhaps for not totally peaceful purposes. With the many restrictions placed on German military power at the end of WWII, there is probably no way anyone with German backing could have gone into the Rocket business** on German soil **proper. Someday someone with far better sources than either Jonathan or Coop may produce a fascinating book on this subject. Thank you Jonathan for setting the record straight.**

SWAN FEED

Can the Swan feed horn for the Spherical antenna be constructed out of a material such as copper? If so, is there some advantage to this? What about stainless steel or other alloys since copper is a soft metal?

Paul Fox
Washington, D.C.

Far more critical [with one exception] than the chosen material for the 'deep throat' feed on the Swan Spherical is that care with which the builder duplicates the design from the manual. Actually, virtually any durable metal will function within a tenth dB or so of any other similar metal. A friend of Oliver's qualified to undertake such an analysis [Bill Ott of Bisbee] determined that the user might pick up a maximum of 0.2 dB system gain by plating the galvanized sheet metal in use by Oliver on his feeds with a silver solution. This is a double plating job however as silver will not directly 'take' to galvanized metal. The one exception that you do want to avoid is PC board. Double sided board almost has to be used because of mechnical reasons and you end up with two surfaces offset from one another by the width of the insulating material. These parallel 'planes' tend to create all sorts of unpredictable surface currents in the 4 GHz energy and as Oliver says you cannot even begin to estimate the mal-performance of a feed horn constructed from double sided PC board. So avoid it, perhaps wisely, for all feed horns!

FILTERS AND CHIPS

Thank you for the prompt delivery of the Howard Terminal manual. Can you tell me if:

1) There is a magic number for the bandwidth of the 1200 MHz bandpass filter utilized in the Howard high i.f.;
2) What the value is for the chip bypass capacitors in the bi-polar LNA described in the Howard Manual?

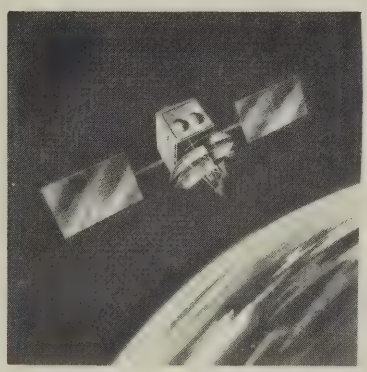
Adam Robbins
Manhatten Beach, CA 90266

The 1.2 GHz bandpass filter should have 3 dB skirt selectivity in the 35 to 40 MHz range. The real selectivity in the system is determined at the 70 MHz i.f. and as long as the 1200 MHz i.f. passband is adequate for slightly more than a single channel you should have no difficulties with chopping valuable baseband material in this section. The chip capacitors are typically in the 200 to 300 pF range with 270 a common value. They are not critical as to value and some experimenters are getting along fine with values as high as .001. They must be chip capacitors however!

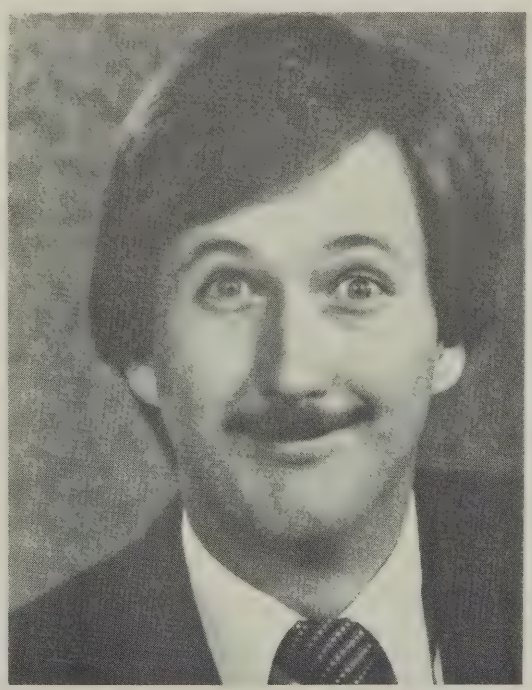
BACK TO BASICS

It has been a long time since I have had as much fun as I did at SPTS '79. It reminded me of my early days in amateur

SUPER TV IS HERE
via satellite



EARTH STATIONS INSTALLED
DOZENS OF CHANNELS
CRYSTAL CLEAR RECEPTION
TELLURIDE ELECTRONICS
THE TV MAN
PEKKARINE BLDG. 728-4521



radio when it was all new and exciting. You put together a most interesting program.

You may recall that Tay Howard introduced us. I've talked with Tay about the possibility that a number of people just getting started with system design (and perhaps the old hands as well) might be interested in a presentation on some of the basic terminology of satellite TV reception. If you are interested I would like to put together a 30 to 45 minute presentation that could touch on some of these subjects. Units of measurement, their use and origins have interested me since I was an undergraduate and I think it is possible to present such information in a manner that is informative while not putting people to sleep. The ultimate purpose of such a presentation would be to leave SPTS attendees with a clearer understanding of such things as EIRP, space attenuation, the T (temperature) factor as it relates to microwave antennas and receivers and so on.

Jack E. Trollman
Mountain View, CA 94040

Jack, who is presently a member of the technical staff at ARGOSystems, Inc., is one of the many very talented people now working on his own nickel in this field simply because it excites him. We expect to see Jack's presentation on measurement basics at an early SPTS in 1980 and possibly as an article here in CSD before that time.

SURPLUS MICROWAVE

After receiving your Home Satellite TV Reception package I acquired a used microwave TV relay system; a Raytheon KTR-1000A receiver and control system presently operating in the 7 to 8 GHz region. I would like to know if this could be utilized for DOMSAT private use. If not, could you send me some information on who might know the answer to this question?

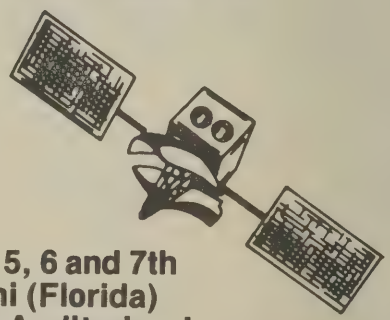
Jimmy W. Word
Route #2
Killen, AL 35645

We are not familiar with the Raytheon KTR-1000A but the fact that it is now operational in a band nearly an octave [i.e. 2 times] higher in frequency than the DOMSAT band of interest suggests to us that you are at best going to have problems with the GHz input end of the system. Waveguide inputs, flanges, mixer or mixing cavities and so on are dimensioned to fit the size or length of the GHz energy they are designed to intercept and ultimately demodulate. We suspect the mechanical signal handling hardware in the input side of this system is simply operating 'above cut-off' [i.e. at a frequency where 4 GHz energy is severely attenuated] and while it might [that's an uneducated might!] be reconfigured so as to electrically operate at 4 GHz we would expect that you would have to do major mechanical [metal bending] surgery to the input to get it to even pass 4 GHz energy. Perhaps one of our readers is more familiar with this piece and will write to you directly.

WEATHERPROOF

Down here in the hurricance belt anyone with a TVRO system has to take special precautions to insure that when a storm is coming that we have someplace to stow our terminals. Here at A-B Electronics we have our 12 foot (Anixter-Mark) prime focus feed dish mounted on a polar mount on the south side of our building. When this season's group of storms headed towards Florida we were forced to pull the dish off the mount and move it inside. It turned out to be unnecessary this year; but then you never know! We are looking forward to having SPTS '80 here in the Miami area in February and will be glad to assist attendees from the Caribbean and Central and South America with their communication needs. As a professional firm dedicated to bringing modern communications to that region of the world, we are actively working with a number of people and firms who have an interest in satellite TV

SPTS 80 MIAMI



FEBRUARY 5, 6 and 7th at the Miami (Florida) Bayfront Park Auditorium!

MORE THAN 25 SEMINAR SESSIONS jammed into three activity packed days. H. Paul Shuch, Taylor Howard, Oliver Swan, Robert Coleman and nearly a dozen other 'satellite-innovators' will teach the latest in low-cost satellite TV technology.

SPECIAL SESSIONS AIMED AT MARKETING the satellite TV service to rural residents of North, Central and South America. A special session devoted to reception techniques required in the far eastern caribbean, and Central America; a separate session (in Spanish!) to teach reception techniques and requirements in northern South America!

SPTS '79 WAS A SELL OUT. Registration forms are now available for SPTS '80/Miami. Each registrant will have the option of receiving the Howard, Coleman and Swan TVRO system manuals as a part of his registration package. Come to SPTS '80/Miami and learn all about the low-cost satellite TV revolution, what it means, and how to be a part of it. Call or write for your registration forms now ... don't be left out when SPTS '80 fills up!

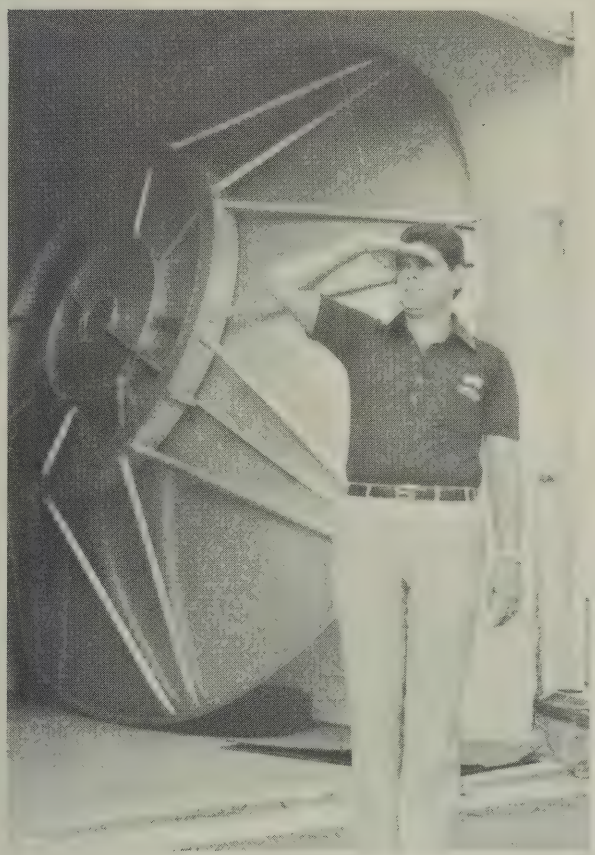
SPTS '80 / MIAMI

Write: SPTS '80/Miami
P. O. Box G
Arcadia, Ok. 73007

Call: Satellite Television Technology
(405) 396-2574 between 9 AM and
4 PM central time weekdays.

reception outside of the U.S.

Robert Behar
A-B Electronics, Inc.
1783 West 32nd Place
Hialeah, FL 33012



Behar is shown here watching . . . and waiting, with A-B's 12 footer safely out of the way of hurricane force winds. A-B Electronics recently completed acquisition of a New York state firm called VHF Engineering; one of the prime manufacturers of VHF and UHF communications equipment. VHF Engineering is being moved to Hialeah where the product line will be expanded in 1980 to include some TVRO receiving hardware. One of VHF's more interesting products is a ten watt UHF [TV] range transmitters which can be adapted to companion VHF Engineerig 100 watt amplifiers to provide low cost re-distribution of satellite TV signals in areas of the world where the system can either be licensed or allowed. Behar will be a part of the SPTS '80 program where he will describe the system that includes low cost receiving converters.

MICROCOMM APPLICATION NOTES

A number of "app-notes" prepared by H. Paul Shuch of Microcomm (14908 Sandy Lane, San Jose, California 95124) are available. For **each** app note requested send $1.00 (U.S. currency; outside of U.S. send 3 IRC's per app note) **plus** a stamped (15 cents U.S., extra payment outside of U.S.) self addressed envelope.

TECHNICAL LITERATURE AVAILABLE

Title	App-Note #
Solid State Microwave Amplifier Design	1
Cost Effective Modular Downconverter for S-Band WEFAX Reception	2
A Vidiot's Guive to Microwave TV Links	3
Antenna/LNA Tradeoff Analysis for 3.7 to 4.2 (TVRO) video terminals	4
Microstrip - Magical PC Technique Explained	5
Calculating Antenna Bearings for geostationary satellites	6
Calculating Preamplifier Gain from Noise Figure Measurements	7
A Low-Cost Modular Receiver for DOMSAT Video	8
A Low-Cost Microwave Spectrum Analyzer	9
RX-1691 Instruction Manual - complete schematics, installation and application information for S-band Weather Satellite downconverter. Note: Price is $10 in U.S., $12.50 elsewhere.	10
RX-4200 User's Manual - complete schematics, circuit descriptions for Microcomm downconversion module set for 3.7 to 4.2 GHz video (DOMSAT) reception; includes circuit information for compatible baseband processing unit. Note: Price is $25 in U.S., $30 elsewhere.	11

SATELLITE INNOVATIONS

Satellite Innovations (P.O. Box 5673, Winston Salem, N.C. 27103) has a variety of microwave and satellite parts, plans and supplies including chip capacitor kits, feedhorn tubing (2" diameter), Teflon PC board and various sub-assemblies for a TVRO receiver plus plans for a polar mount and rotating feed horn. Inquire directly.

ROBERT M. COLEMAN

Satellite experimenter Robert M. Coleman has a number of PC boards and chip capacitor kits available for the construction of GaAs-FET LNA stages, bi-polar LNA stages, an active mixer utilizing a GAs-FET device and AVANTEK VCO. For full information contact Robert M. Coleman, RFD 3, Box 58-A, Travelers Rest, S.C. 29690.

MICROWAVE GENERAL

Microwave General (2680 Bayshore Frontage Rd., M.S. 210, Mountain view, Ca. 94043) has a data sheet describing a 10 foot diameter 3.7 to 4.2 GHz reflector equipped with a high efficency Cassegrain feed system which they claim makes the ten foot reflector function with gain equivilent to a full 12 foot parabolic. The antenna is molded, one-piece construc-

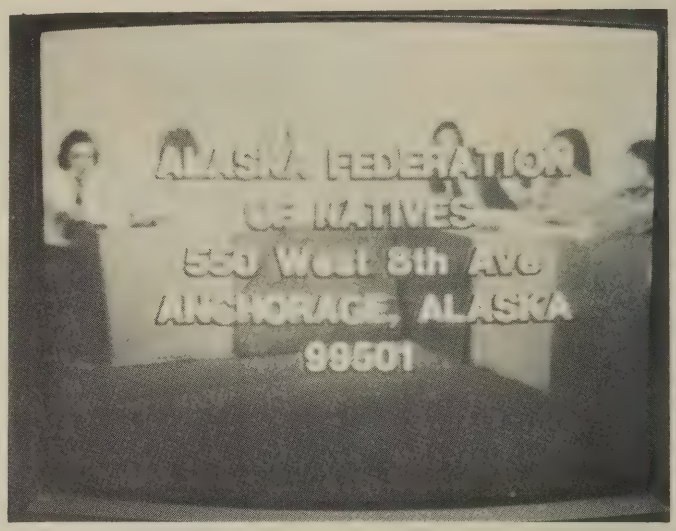
tion, with a flame sprayed relective surface. Full details are available directly from MG.

INTERNATIONAL CRYSTAL MFG CO.

ICM (10 North Lee, Oklahoma City, OK 73102) has a data sheet describing their newly released TV-4200 satellite receiver; a 24 channel frequency agile double conversion receiver with dual audio outputs for 6.2 and 6.8 MHz. Contact ICM for full details.

AVCOM OF VIRGINIA INC.

AVCOM has a short-form manual that describes their PSR-3 satellite receiver designed for 'low cost reception' of satellite video (and other modulation format) signals. Contact AVCOM at 10139 Apache Road, Richmond, VA 23235.



TECHNICAL NEWS NOTES

NASA completing tests of new bandwidth compression system that claims to allow 'full motion, high resolution color' transmission in bandwidth approximately 15% of present bandwidth. NASA also working on Ku (11/12 GHz) band transmit antenna system for bird(s) that will allow breaking U.S. area up into 17 decrete 'antenna patterns' for descrete feeds. Similar approach on C band (4 GHz) is feasible, but with approximately 6 descrete beams rather than 17.

Australian 'tests' using nearly dead CTS-Hermes bird were successful. Tests included moving 11/12 GHz experimental bird to position over Pacific so bird could be transmit-accessed from Canada, received in Australia. Approximately 50 Canadian built terminals with mass production retail cost in $2,500 region were installed using NTSC Sony receivers for local display in Australia. Australian programming was taped in Sydney, flown to Canada where it was reconverted to NTSC and sent via bird. Canadians want to get piece of Australian satellite hardware buying dollar and test was elaborate show and tell towards that end.

A series of Hurricanes this summer wiped out Santo Domingo, Dominican Republic INTELSAT terminal. Problem became severe late in September when local TV stations found they were going to have to go without normal INTELSAT fed Major League baseball and World Series games. One station decided to bite the bullet, procured 11 meter Harris (RMS) receive antenna through southeastern U.S. firm. Antenna was installed by late in September with 120 degree LNA and SCI receivers on third floor roof of station. Local INTELSAT representative immediately took issue to government telling them station receiving signals via U.S. domestic birds would violate 'domestic bird' nature of U.S. satellies. Station responded by editorializing every 30 minutes over air that unless government approved service, island would go without World Series since INTELSAT station was unable to deliver programs. Station won after pickets for baseball showed up throughout city. Interesting footnote: system showed that SATCOM FI service in area (with 11 meter antenna) was well above sparklie level, FI measured hotter than WESTAR II while COMSTAR III was 'overpowering'. Station had previously been budgeting approximately $100,000 **per year** for INTELSAT feeds of occasional events; full 11 meter terminal cost them under $90,000. Controversy over station's legal right to access U.S. domestic satellite(s) continues.

RCA, reportedly unhappy with 'NASA attitude' over shuttle program, is talking with Ariane about launch of SATCOM IV. Reportedly if RCA can find another satellite to piggyback with IV, they may go offshore for launch.

ABC latest radio news network to get serious about AOT (Audio Only Terminals). Has asked for detailed proposals from all three satellite system operators, would utilize 3.3 meter dishes, possibly digital audio technique, 'stereo quality' and total affiliates involved is 1,600.

WESTAR now testing 3 for 1 digital video on WESTAR I transponder 10; capable of sending three complete sets of video (with digital techniques) through a single 36 MHz wide transponder.

Soviets have placed fourth Statsionar T (Ekran series) bird into orbit with 714 MHz downlink (see detailed report this issue CSD). Bird is believed to be in place replacement or standby for older satellite now nearing end of projected Soviet service life.

COOP'S COMMENT ON PROGRAMMING

Programming Rights Confusion

As virtually anyone who owns a VCR now knows well, Judge Warren Ferguson has found for Sony in the copyright infringement law suit brought by MCA, Disney and other 'friends'. The three year old case asked the court to determine whether or not television viewers, in the privacy of their own homes, using a VCR machine they owned, were paying on or borrowed from a friend, could videotape over the air broadcast television programming without violating the Copyright Laws of this country. The Judge decided that what you do with a VCR in your own home is pretty much your business; that no copyright laws were being abridged when you videotape the local NBC (et al) station programming for later view or review.

Nobody who really knew very much about this case ever apparently felt that Sony (who was being named as the defendent because of their stellar marketing position in home VCRs some three years ago) was in much danger. However, just to be safe, and sure, Sony (and other VCR marketing firms) have been placing small print on their advertisements and in their instruction booklets by way of telling purchasers or prospective purchasers that Sony (et al) made no claims or representations about the buyer's right to videotape Bonanza or whatever. The case will undoubtedly wind its way through the appeal routes and I suggest it will be struck down at each turn.

In spite of Sony's small jeopardy in this suit, many people were on eggs awaiting the verdict. The case was complicated and the evidence overwhelming if not damaging. Now the ruling is out, one would expect a change in the advertising stance from all VCR manufacturers with more open-touting of the 'time shift' and 'repeat viewing abilities' of the home VCR unit. Alas, the decision for Sony and against MCA and Disney and their ilk does absolutely nothing for the more pressing question in satellite TV land. That being, who owns the rights to what; when?

Already CSD is receiving letters from readers and others who are proclaiming with newspaper stories attached, that "the way is now clear for anyone who wishes to tune in HBO (etc.) off the satellite to do so without fear of legal complications...".

Wrong. **Double wrong.**

First of all Judge Ferguson was very explicit about videotaping anything **except** terrestrial (broadcast to the public) television. He said **"This court is not deciding whether tape duplication, or copying from pay TV, is prohibited."** He went on to note **"The ramifications of this new technology are greater than the boundaries of this lawsuit. A court reviewing the limited claims...in a particular factual setting cannot and should not undertake the role of a government commission or legislative body exploring and evaluating all the uses and consequencies of the videotape recorder..."**.

So if you have been told that the 'Sony Suit' decided that you are (1) free to view (and/or videotape) off-air pay TV (as in STV) in your home, or, (2) free to receive MDS in your home without paying for it, or, (3) free to intercept and view satellite TV channels in your home for which you have no authority to view...you have been told wrong. The suit was very narrow and the Judge wisely footnoted just how narrow it was. In fact he seemed to be saying that he was handling all of the case he could handle by concentrating on the relatively simple question of videotaping for private, non-compensatory viewing in one's own home.

Does that mean that satellite (or MDS) viewing without authorization (or contract) **is** illegal, even when conducted in the privacy of your own home and without any 'benefits' derived? Who knows.

Congress was, until recently, on track to update the 1934 Communications Act. The updating, originally spearheaded by Congressman Lionel VanDeerlin (D. from San Diego) who heads the House Subcommittee on Communications, intended to rewrite the oft quoted but ill understood Section 605. In fact, section 605 was destined to become section 549 and in their Subcommittee report the House said of Section 549 (to be):

1)Section 549(a) would amend 605 so that 'secrecy of communication' charges could only be brought against employees of Common Carriers; not against 'persons' (i.e. the public) at large.

The logic here was that people engaged in the transmittal of 'private materials' were especially capable of 'intercepting and benefiting from' the content of these 'messages'.

So even **with** the Sony/Disney decision we have no clear cut direction for the nagging question of the satellite age; who owns what, when? This leaves us with an antiquated Communications Act that talks broadly of using private material for personal benefit without adequately defining what is private and when you benefit. We have a more modern Copyright Act, passed in 1976, that addresses such entities as cable television systems engaging in long range television reception (for a fee, and establishing a Copyright Tribunal to collect those fees) but it too misses totally the question of you, sitting in your home, with a private satellite terminal tuning in Hee-Haw from WTBS. The simplistic answer oft quoted is that you, an individual in Bozeman, are simply a 'small cable system'. And having defined what you are, they suggest you send your $60 per year per channel to Washington for the Copyright Tribunal slush fund!

This too is a woefully short solution to a real world problem. But...does anybody have an answer. Clearly the law does not.

COOP'S SATELLITE DIGEST (Programming Edition) is produced monthly by Satellite Television Technology, P.O. Box G, Arcadia, Oklahoma 73007 (405-396-2574). CSD is available in two separate editions (Programming and Technology) or as a combined subscription. Subscription rates are $30 per year for first class mail delivery within U.S.A. or Canada for either edition, or $50 per year for the combined editions. Outside U.S.A. or Canada add $25.00 per year for any subscription. All subscriptions to be paid in advance in U.S. funds drawn on a U.S. bank; no invoicing.
Contents are Copyright 1979 © by Statellite Television Technolgy and any duplication or reproduction in any form without written permission is a violation of Federal Statue (17 USC 101 et seq.).

SWAN SPHERICAL SUCCESS STORY

OLIVER'S DREAM

Oliver Swan is an antenna wizard. He has been an antenna wizard since the early 50's when, in Stockton, California, he spent months creating the design for the first commercially offered log periodic type antenna design. Stockton, in those days, had no local television. San Francisco VHF television came over the coastal mountain range and the 5 Kw transmitters and short transmitting antennas of that era made the 70 or so mile jaunt to Stockton a long one indeed. Most TV addicts watched snowy San Francisco television on stacked conical antennas although a few had bothered to install multiple yagi arrays; one for each of the then active channels (4, 5 and 7). Oliver decided that there had to be a way to **combine** the broad bandwidth of the conical with the gain and directivity of the yagi. He recognized that the yagi was a "hi-Q" (or selective as in narrow bandwidth) antenna primarily because **(1)** the driven element has a resonant frequency and that frequency is fairly well defined, and, **(2)** the directors and reflector(s) are like bandpass filter elements; they too are resonant. Oliver Swan's approach was to make all of the elements 'active' (as in making them all driven), and tapering the multiple driven elements over the frequency spectrum of interest. And so the first log periodic was born and put into manufacture in Swan's small antenna shop on the outskirts of Stockton in about 1952.

Oliver's approach to antenna design has never previously attracted **widespread** interest. His VHF television antennas were popular in his area but lacking the financing and marketing experience required they stayed a local antenna sold largely to a handful of dealers and direct. He later expanded the multiple driven element antennas to the amateur VHF and UHF bands and today's **KLM** (amateur) antenna line traces directly back to Oliver Swan who sold the amateur line of antennas to the KLM folks some years ago before 'retiring' to Arizona.

Once in Arizona, settling on a 160 acre tract homesteaded by his grandfather back when Bisbee was just starting to turn into an important center for retrieving copper from the earth (one of the largest open pit copper mines literally swallows up the town), Oliver Swan went to work on bringing television to rural residents around Bisbee. There is no local television for Bisbee; the nearest U.S. transmitters are licensed to Tucson, more than 120 miles by air. Bisbee, like many such communities, has cable. But not everyone in Cochise County lives in Bisbee; in fact the area is literally dotted with small settlements largely made up of retired Americans looking for sunshine and warm year around weather in their 'golden years'. Plus the usual smattering of hard crusted natives who were born here, married here and will one day be buried adjacent to an open pit copper mine.

While in Stockton Oliver Swan perfected the sometimes elusive trick of spotting 'knife edge refraction'; a tricky at best propagation mode that abounds in small spots in mountainous country wherein VHF and UHF signals bend or

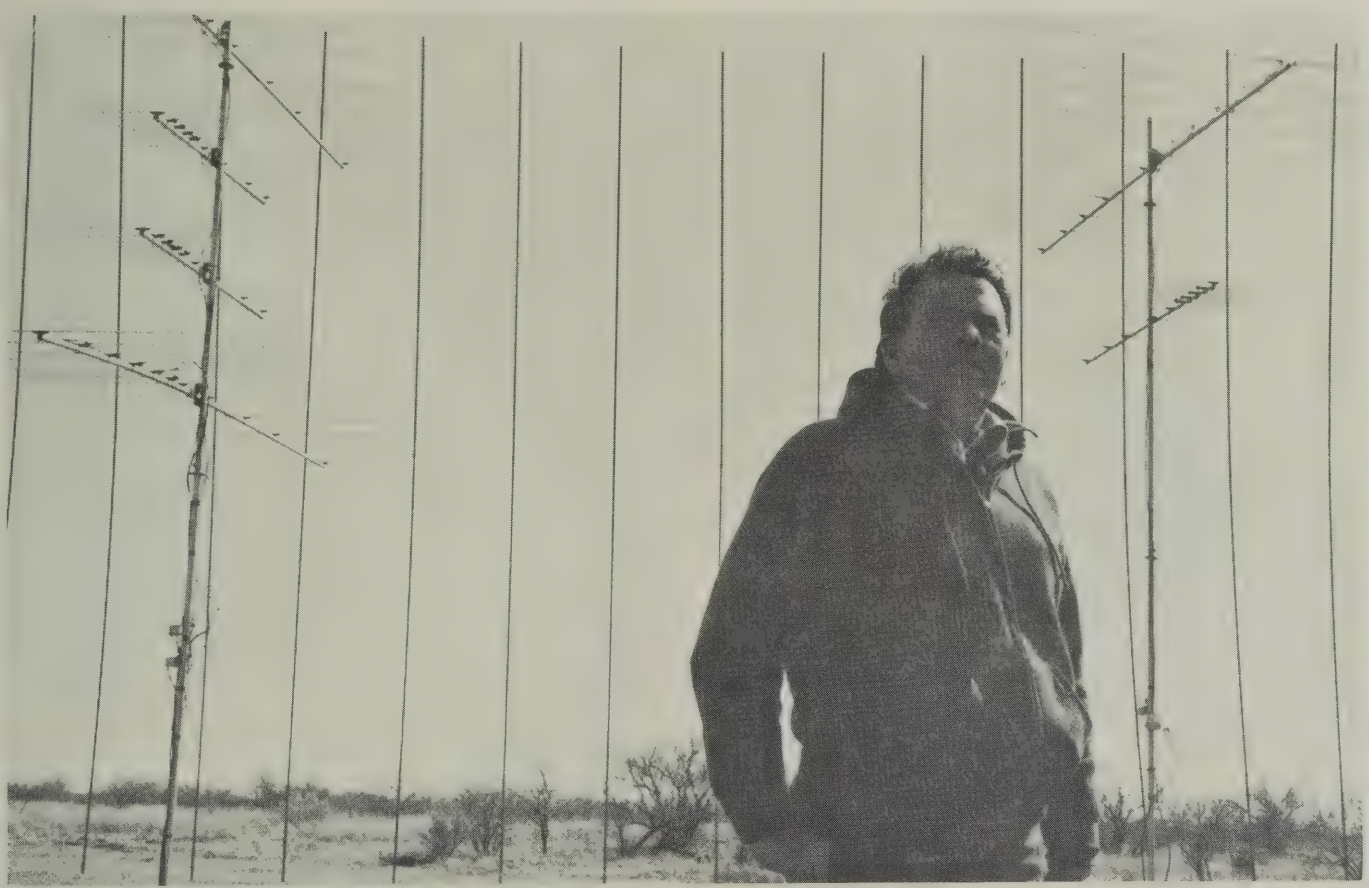
ULTIMATE LOGI - Swan's log periodic approach, married to a considerable series of passive directors [and single reflector] resulted in 40 element long boom array in mid 70's. Mountain peak in background provided knife edge refraction from 120 mile plus distant high band VHF TV station.

refract over well shaped mountain peaks to 'illuminate' smaller yet patches of soil tens or hundreds of miles distant. Knife edge was the best way of finding Tucson (and Phoenix although it is more than 200 miles north) VHF TV signals. With the patience of Job and the skill of a man wise in the ways of locating water in a desert, Oliver out with 'divining rod' in hand (a dipole antenna in his case) and a field strength meter and began probing for distant signals. Wherever he found Tucson and/or Phoenix signals he calculated how many homes could be served from each 'site'. Often there would be a dozen or two within say a couple of miles of 'cable' and there Oliver would establish a miniature Oliver Swan bred "cable TV system". Today Oliver has more than a dozen such cable systems with typically 50 or fewer subscribers per system.

With the produce from his 160 acres, a devoted family and the kindness of nearly perpetual summer the meager income from perhaps 450 cable subscribers has allowed Oliver to make ends meet, take care of his family, and dabble.

It is the latter . . . the dabbling . . . **that interests us mostly here.** For several years ago Oliver began dabbling with something called a 'Spherical Reflector'; a rather unusual type of antenna that is related by lineage to the parabolic family. Aware that his knife edge refraction signals were often very weak, and present only in small patches perhaps 100 feet or less across and half that depth, Oliver had always tried to build VHF off-air antenna arrays that would capture every last microvolt from the distant transmitters. **"When you start off with perhaps 5 microvolts on a dipole you have a long ways to go to reach a snowfree picture"** he would muse and then proceed to measure and determine the limits of the area 'illuminated' by the knife edge signal, and having done so return to the drawing board to conceive an antenna array that would fill the area with aluminum. Eight and sixteen bay Swan Logi arrays were typical answers; usually 4 or 8 antennas wide and two antennas high.

As any experienced antenna person knows well, two or more antennas, when stacked or phased are supposed to add 3 dB maximum additional signal voltage each time the physical size of the array is doubled. However, as anyone who has practiced this art is aware, between the 3 dB theory and the real world you may often lose almost as much as you gain through the phasing lines and harnesses and couplers and connectors. So Oliver thought about the problem.



And thought and thought. And he decided that since gain was related to capture area of the antenna, the best approach would be a single reflector surface, concave in design so that all of the energy intercepted by the array (which typically would 'fill' the area illuminated by the knife edge refraction) would be re-focused to a central point. **"In this way a single, even simple, feed point antenna could be installed at the 'focal point' of the reflector surface and the gain of the system would be the sum of the reflector surface focused energy plus the gain of the feed or focal point antenna; less the inefficiency of the reflector surface".**

And so, some three years ago, the 'Swan Spherical **TV** Antenna' was hatched; Out of steel pipe and guy wire and 2 inch opening chicken wire mesh. Devoted followers of the **Satellite Magazine** program (transponder 21, Thursdays, 12 noon eastern) will recall a three program series this past spring during which Oliver took viewers on a tour of his off-air VHF Spherical reflector antenna systems.

There were doubting Thomases of course. In spite of the fact that a very similar antenna had been co-conceived at about the same point in time by the Chief Engineer for Tijuana television station XETV, Tony Frias; and Frias antenna was extensively discussed in a three part article appearing in the January-March (1978) issues of **CATJ.** But more than there being doubting Thomases, Oliver was this time too late with the right idea. Prior to 1976 or so, if Oliver or anyone else had come along with this antenna, the largest consumers of larger-than-life television antennas, the cable TV system operators of North America, would have beat a golden pathway to the inventor's door. But alas, in the 1976 to 1978 period the larger-than-life antenna people, the cable operators, had begun to discover a new form of television signal delivery; the satellite. And as more and more services came on the satellite, fewer and fewer cable systems had a need, or a desire to battle for, distant over-the-horizon VHF or UHF terrestrial signals. Oliver was not unaware of all of this happening, nor was he particularly concerned that nobody beat a golden pathway to his door asking for the secrets to his Spherical VHF/UHF antenna system. Oliver too was looking skyward.

By late in 1978 Oliver Swan had decided that the right approach to satellite TV reception was the same basic Spherical antenna he had created for VHF and UHF TV. Only some changes would be required. First of all, the tolerances at 4 GHz were considerably tighter than at 200 (plus or minus 100) MHz. Where a two inch accuracy tolerance was acceptable at TV channel 13, a 0.050 inch accuracy tolerance was widely acclaimed as 'maximum-allowable' at 4 GHz. That didn't bother Oliver. **"It's all mechanics. A person just has to build to tighter specifications; that's all!"** he would note.

VHF TV SPHERICAL - installed in Arizona for one of Swan's many very small cable TV systems utilized 40 foot tall steel pipe supports and 2 inch chicken wire mesh. Basis for TVRO Spherical started here in 1976.

By February of 1979 Oliver Swan had a framework constructed; a huge 20 foot by 20 foot affair fabricated out of steel pipe and lots of cremated welding rods. A photo of the super structure appeared on page 59 of the March 1979 **CATJ.** We took that photo while visiting Oliver for our **Satellite Magazine** videotaping. Oliver seemed, at the time, not terribly concerned about making the Spherical **Reflector work 'to tolerance' although he did have certain conceptions about its final form which subsequently changed. "The surface will be thin aluminum sheet"** he noted at the time **"laid down in strips from top to bottom".** That was before he did some checking with people like Taylor Howard who had (it turned out) been using a screen mesh reflector for his 15 foot parabolic terminal since 1976.

But the feed . . . that was going to be tough. A number of text books revealed that you probably could not maintain phase angle over such a (comparatively speaking) wide antenna surface.

Several people Oliver did **not** solicit advice from told him (none the less) **"at best you will end up seeing perhaps six or seven feet of the reflector and no more. So why bother to build a bigger one?"** Oliver had heard that type of story before. Everyone who saw his early efforts at a 'broad-banded yagi' scoffed at the concept he had. **"A yagi is just naturally a narrow band device and you can't stack dipoles along a boom and expect to maintain phase purity. The think will end up as a giant creator of ghosts!"** one highly respected antenna engineer of that era advised Oliver. **"If you are going to stretch all of that chicken wire over those frames at least build a parabolic reflector; we know they work"** suggested another antenna person nearly 25 years after Oliver invented the log periodic.

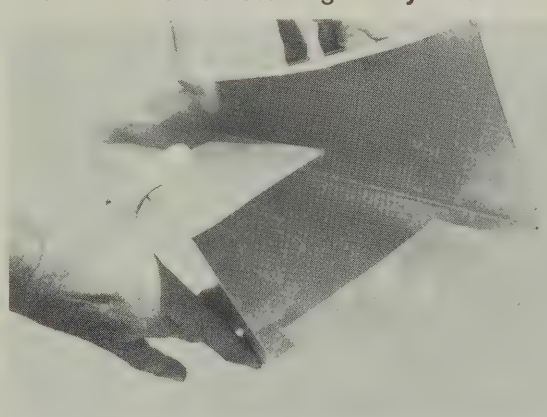
Oliver has an unusual trait. He seldom gets angry when he knows the person offering the advice is well meaning. He simply shrugs it off, goes to his shop and closes the door. Oliver is most at home with a metal saw, a pair of tin snips, a drill press and a stack of metal. He loses himself for days in his galvanized metal shop building just adjacent to his home. He lost himself there for several weeks last spring, drawing lines on scrap pieces of cardboard and running his calculator overtime. When he emerged from the shop after a marathon session of thinking and tinkering and drawing late this past spring, he knew he had perhaps approached the reflector surface incorrectly. There it was . . . the same huge skeleton of February, rusting in the hot Arizona desert sun, looking for the world like a victim of Lady Bird Johnson's war-on-billboard signs.

By early in June the big monster **was surfaced;** With common aluminum window screening. And a second version, smaller in size, was taking shape along side of the monster. It was ten foot across, and resembled a bed spring that had supported an elephant in the middle; concave as it were. Both went into operation at more or less the same time.

The feedhorn was the principal problem. Designing **a reflector** that could be duplicated inexpensively was one thing. Designing a reflector surface that could be knocked down for easy shipment was an even smaller problem. But the feed horn; someone had told Oliver that the world's biggest Spherical antenna, the Arecibo (Puerto Rico) radio astronomy 'dish' had limped along with an inefficient feed for nearly eight years because the world's best antenna experts had not been able to resolve the question of how do you properly illuminate such a massive structure and not end up wasting 50% or so of the reflector surface. Taylor Howard and others supplied Oliver with exhaustive reference materials from the Arecibo experiment. And he got plenty of advice too. In the end Oliver piled the reference materials in a corner where today they gather dust and he went back into the shop where his favorite tools resided. Around eight cut and try feed horns later he had it whipped. The ten foot Spherical was producing pictures in a 33 to 34 dBw EIRP contour which had either no sparklies at all, or the faintest hint of sparklies on just a transponder or two. Word spread fast and the doubting Thomases re-surfaced all over again. Nobody could sit out in the desert of south-eastern Arizona and create a ten foot aperture TVRO antenna that would simultaneously receive noise free pictures from up to nine different satellites. It just wasn't possible!

FEBRUARY 1979 STEEL FRAME - a 20 foot by 20 foot monster was Swan's first effort at TVRO Spherical antenna.

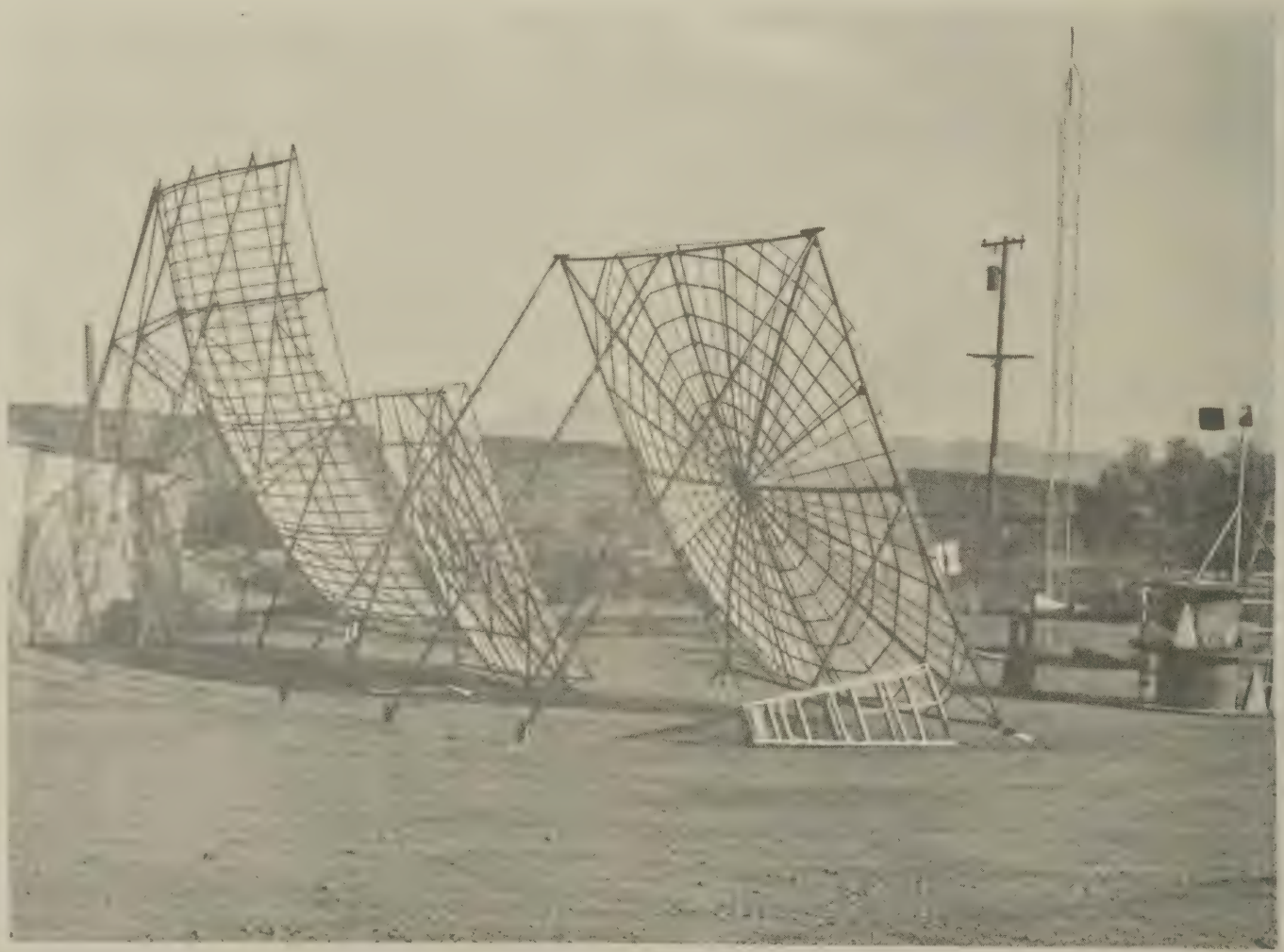
By the time Oliver reached the Oklahoma City SPTS '79 meeting this past mid-August he had some pretty convincing proof. A 16 foot version of the antenna had been shipped to a TV station in El Paso where tests were conducted on a one on one basis against a name brand 4.57 meter parabolic antenna. Oliver won by around 1.5 dB. But anyone who was **determined** to be a doubting Thomas wasn't listening. **They** had not been to



TYPICALLY SWAN - feed horn for TVRO Spherical is fabricated from galvanized sheet material, formed on bench vice and soldered together!

El Paso and **they** had not seen it work. But the SPTS release of the antenna did attract some positive interest as well. A pair of well known cable television operators, also from west Texas, arranged for Oliver to transport another 16 foot version to a lonely country site where representatives of PBS, the National Cable Television Association, and numerous would-be manufacturers saw it perform. Oliver in his usual fashion arranged to videotape the whole demonstration; starting with the arrival on the site of the pick up truck and ending with three separate feed horns positioned out in front of the Spherical reflector each picking off a multitude of transponders from a different satellite. (Segments of that Swan created tape are included, by the way, in the Swan Spherical Antenna videotapes available from STT.)

From that demonstration word again spread fast. At a September meeting of the Board of Directors of the cable association, men who would hardly pay attention to an antenna unless it arose in the night and bit them severely, spent hours detracting from their important industry business to discuss the amazing demonstration that all had by then heard about. The cable industry, in particular, had a 'special interest' in **any antenna** that could receive signals from **two or more** satellites, simultaneously, without being re-positioned. For the cable industry will, come this next January or so, be facing a twin-satellite situation wherein cable programming will be available simultaneously on both RCA SATCOM FI and the yet to be launched FIII. With the uncertainty that continues over which of the existing popular satellite channels will be on which bird, as well as which new service will be available on which bird . . . well, it was almost

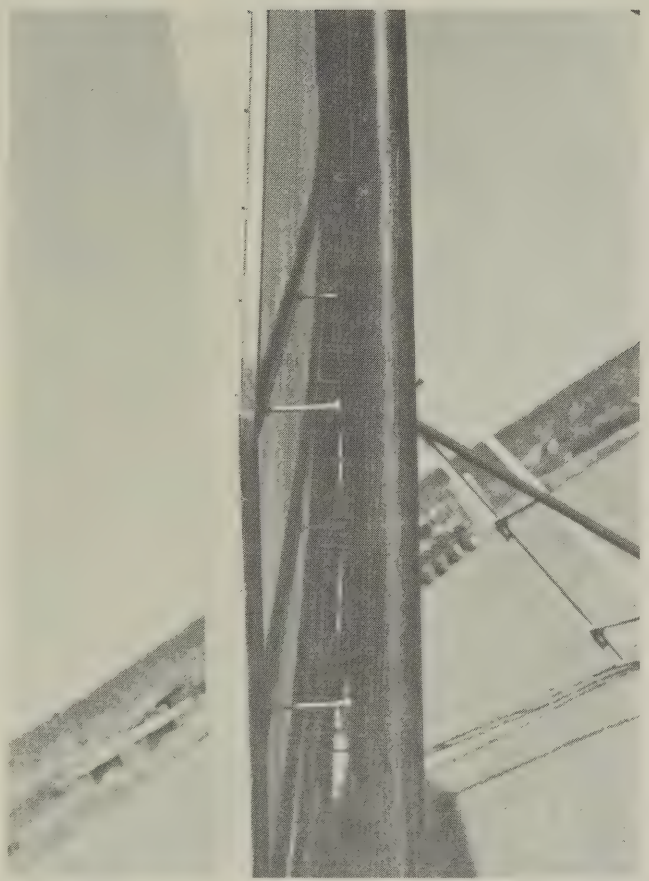


THREE IN A ROW - massive 19-20 footer [far left], backyard style 10 footer [center] and CATV type 14 footer [right] are lined up at Swan's Arizona test range.

certain that every cable system in the country would be seriously looking at **two separate parabolic antenna systems** before far into 1980. Oliver Swan had the answer. One antenna, capable of receiving signals from two birds at one time, or three or as many as could be crammed into say 40 degrees of orbit arc.

Oliver in the meantime was not sitting in Cochise County weaving baskets. His brother Henry, with an accounting background, began to run some numbers. The antenna's costs depended upon how you set up to produce it. Both Oliver and Henry knew that the antenna was not going to be produced using 1.25 inch 'gas' pipe and window screening. At least not commercially (although dozens were already under construction by mid-September as hundreds of people were introduced to the design through STT's **'Swan Spherical TVRO Antenna Manual'**). Henry and Oliver worked out a design for a folded/folded rib constructed from a sheet metal product. This provided light weight ribs for the concave surface, but strong enough to withstand winters that never arrived in the Bisbee area. Henry returned to the Stockton area late in August to set about creating a manufacturing facility for the antennas. With the limited internally generated capital Henry figured they could initially turn out five antennas per week. Oliver meanwhile was cross checking himself on the feed horn design and answering the burgeoning number of telephone calls and letters and then finally personal visits from people who had heard about the incredible antenna. One of those visitors turned out to be Clifton Gardiner of Gardiner Communications Corporation in Houston.

"I don't know what I really expected to find when I got to Oliver's place" notes Gardiner, **"but my engineering advisors had warned me to be prepared to find a bunch of chicken wire stapled up on fence posts and very snowy, degraded pictures".** Gardiner's engineers were of the doubting Thomas variety. Cliff, however, has always had a mind of his own and so he made the trek to Bisbee. **"A person really has to want to see Oliver to make that trip!"** smiles Cliff. **"It's quite a hike from Tucson".** Gardiner was not prepared for what he found. Oliver ran the Hughes loaner receiver STT obtained for him through the paces on SATCOM FI on a 14 foot version of the antenna. **"I kept looking for sparklies or some sign of degradation. I'd scratch my head and look at the pictures on the professional monitor I brought with me, then I'd walk over and run my hand down the aluminum window screening. And then I'd just shake my head in dis-belief"** recalls Gardiner. But Oliver was not through. He trotted out additional feedhorns and additional LNAs and proceeded to line them up for Cliff. **"one for**



BEEFY CONSTRUCTION TECHNIQUES - followed with Spherical for TVRO work. Concave reflective surface is formed with myriad of threaded adjusting rods [10:24 screws].

WESTAR II, another for WESTAR I and then for good measure we looked at ANIK-B" smiles Oliver. **"In all of the earth station installations I've seen, and our firm has been responsible for perhaps 300 of them to date, I can honestly say I've never seen better pictures"** notes Gardiner. **"Seeing ANIK way down here just a half mile from the Mexican border on a 14 foot antenna surfaced with aluminum window screen is something I will never forget"** he adds.

That was late in September. Gardiner wasn't leaving without an agreement from Oliver but that was no trick; Oliver wanted to give him one anyhow. **"We worked it out where Gardiner will manufacture the antennas for national sale"** notes Gardiner **"and Oliver will be paid a royalty for every antenna we manufacture and sell".** With the cable industry chomping at the bit for an antenna capable of adding a second bird, and Gardiner already well established as a prime supplier of cable industry terminals, the marriage seemed perfect.

Gardiner's agreement with Oliver Swan is the first step in what is now a crash program to put

the Swan Spherical Section (every panel will have a big 'SSS' stamped on it so in the future people can tell 'the original from a copy') into a marketable package. Where Oliver stopped (a completed design, working to or very close to its efficiency capacity) Gardiner's engineers will take over. **"We have to make the antenna look aesthetically nice"** notes Cliff. **"The cable market is a funny market; they want the antenna to look like something straight out of the space age. They are very image conscious and while I have no trouble with gas pipe and aluminum window screen myself I can see that we may have to put as much time and money into making it look 'spacy' as Oliver has put into making it work".** Gardiner is working against a deadline of considerable odds. The next big cable trade show comes up in mid-December in Anaheim, California. With the RCA FIII launch timed for about the same week, and it's operational status to follow within say sixty to ninety additional days, being on hand at Anaheim with a working, saleable, 'aesthetically pleasing' version of the 'SSS' sectioned antenna is important.

Under the terms of the agreement brother Henry, in Stockton, will continue to manufacture a version of the same antenna. **"Henry's agreement with me supercedes the Gardiner agreement"** notes Oliver **"and even if Henry was not my brother, an agreement is an agreement".** Gardiner says he can live with that. **"This antenna is the most exciting thing I have seen in thirty years in the communications business. As good as it is for the cable operators, and their immediate need for two bird reception starting early in 1980, can you imagine how well this antenna is going to function for individual home terminal systems in the years ahead? Oliver has really done something worthwhile here".**

That he has. After more than twenty five years of playing with antennas, Oliver Swan with not formal training and considerable dis-dain for textbook formulas and people who say "you can't do it that way" has at last been recognized for the antenna wizard that a handful of us always knew he was. What other projects does Oliver have in mind, now that he is into the big time?

Well, through this report we have not even eluded to Oliver's talents with a soldering iron, a handful of transistors and other fixed parts. Oliver has had a concept for a truly low cost satellite receiver for some time. He has the same cut and try approach to electronics as he does to antennas. In fact he recently perfected a very innovative signal trap which several of the scrambled TV people have looked at first hand. And part of his arrangement with Gardiner includes his being able to distribute his own antenna (plus Gardiner supplied LNAs and receivers) in the Arizona area. Oliver sees himself installing private TVRO terminals for hundreds of remote Arizonians and even residents of Mexico over the next few years. **"The market here is wide open; and as we get the price down it just gets bigger and bigger and bigger".** What else? Well, there is a project to build a really big Spherical (say a ten meter job) for **transmit** and receive applications. Then some guy asked about mounting the LNA on a track so he could motor drive it from his easy chair; just one feed horn and LNA you understand, but move it along a model railroad like track to change satellites from the TV set. **"That's a small project; probably have it done in a few hours time"** smiles Oliver.

Is there a message here? There are several. It does not take a degree in antenna design to make your mark in the world. But it does take dedication and lots of hard work. Oliver's made it three times running, but it took the combination of the right design **and** the right market environment to really put him into the limelight. Anyone with an idea, willing to spend some time working at it, oblivious to the sneers of those who "know it won't work" can do the same thing. Whether it be in the receiver field, the LNA field, or even in the antenna field. Oliver Swan is on the program at SPTS '80 in Miami this coming February. And one of his 'SSS' stamped antennas will be on hand, with Oliver, for you to see. And if you can't wait that long? Well, the Swan Spherical TVRO Antenna Manual is available now from STT (see inside front cover of this issue of CSD) and with that manual in hand, you too can build a Spherical TVRO antenna!

THIS MONTH'S PROGRAMMING HIGHLIGHTS

CBC Northern Service (English language) was originally available on ANIK III parked at 114 degrees west. More recently, CBC Northern Service has appeared on the 4 GHz downlink portion of the 1979 activated ANIK-B satellite; a dual band satellite with downlinks in both the 4 GHz and 12 GHz bands, at 109 degrees west.

Three video services are offered on ANIK; the French language service originating in Montreal appears on transponder 8 (3980 to 4020 MHz). This is designated the **'A'** pro-

CBC NORTHERN TELEVISION WEEK

CHANNEL C PROGRAM SCHEDULE

YUKON AND MOUNTAIN TIME

Y.T.	M.T.	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
6:00	8:00							
6:30	8:30							
7:00	9:00							
7:30	9:30							SIGN ON
8:00	10:00						SIGN ON	GETTING I TOGETHER*
8:30	10:30	sign on					FANGFACE*	EMERGENCY PLUS 4 *
8:45	10:45	FRIENDLY GIANT					CLUE CLUB*	SEAGULL* SAM
9:00	11:00	ALBERTA* SCHOOLS	CANADIAN SCHOOLS	SPECIAL: WHY SHOULD I CARE	ALBERTA SCHOOLS*	CANADIAN SCHOOLS	Tell me/ Barbapapa Jeremy *	MEETING
9:30	11:30	MR. DRESSUP			MR. DRESSUP		SEARCH & RESCUE	PLACE
10:00	12:00	SESAME STREET					WOW	CFL
10:30	12:30							FOOTBALL
11:00	1:00	DR. DOO-* LITTLE PU MTL	WICKIE* PU MTL	ENFANTS DU 47A PU MTL	IMME&SON* FANTOME PU MTL	TAQRAVUT*	SPORTS	CALGARY AT TORONTO
11:15	1:15					TUKTU*	STREET	
11:30	1:30	WICKS					WEEKEND	
12:00	2:00	TODAY, FROM...						
12:30	2:30							
1:00	3:00	EDGE OF NIGHT						WILD KINGDOM V
1:30	3:30	TAKE THIRTY						ARTS LIB EX VCR*
2:00	4:00	BOB MCLEAN SHOW					YOU CAN DO IT	ONE OF A KIND.VCR
2:30	4:30						NATIONAL GEOGRAPHIC	REACH FOR THE TOP VCR
3:00	5:00	BEYOND REASON					PRESENTS*	COUNTRY CANADA
3:30	5:30	ALL IN THE FAMILY					CBC SAT. EVE. NEWS	HYMN SING
4:00	6:00	THE BEACHCOMBERS					NHL HOCKEY	NEWS
4:30	6:30	MARY TYLER MOORE SHOW					NHL HOCKEY	THIS WEEK IN PARLIAMENT
5:00	7:00	CBC EVENING NEWS					...CONT	DISNEYS WONDERFUL WORLD
5:30	7:30	(EX:VANCOUVER)						
6:00	8:00	IYC SPECIAL: WHY SHOULD I CARE	PEOPLE OF THE SEAL PART ONE *	HAPPY DAYS				BEACHCOMBE
6:30	8:30			FOREST* SPIRITS	TAQRAVUT*	FLAPPERS		MORK AND MINDY
6:45	8:45				TUKTU*			
7:00	9:00	THE WHITE SHADOW	HAPPY DAYS	NATURE OF THINGS WITH DAVID SUZUKI	MUPPET SHOW	ARCHIE BUNKERS PLACE	THE DEVIL AND DANIEL MOUSE	SUPER SPECIAL ANDRE GAGNON
7:30	9:30		THE RAES		KING OF KENSINGTON	FRONT PAGE CHALLENGE	WORKING STIFFS	
8:00	10:00	M*A*S*H	THREE'S COMPANY	THE MUSIC OF MAN: "Quiver of Life:	BARNEY MILLER "	SPECIAL: JAMES BAY	GREAT MOVIES EX VCR	A GIFT
8:30	10:30	W.K.R.P.	THE FIFTH ESTATE		CITIES: "George Plimpton's New York"			TO LAST
9:00	11:00	NEWS-MAGAZINE		SPECTRUM:		DALLAS		MARKET-PLACE
9:30	11:30	WATSON REPORT	MAN ALIVE	"Mad Shadows"	THE * NORTHERNERS			OMBUDS-MAN
10:00	12:00	THE NATIONAL					N.NOTES*	NAT.BUS.
10:15	12:15						NIGHT FINAL	
10:22	12:22						*	
10:27	12:27						(EX:VANCOUVER)	
10:30	12:30	NIGHT FINAL (EX:EDMONTON) *						
10:45	12:45	THE TWO RONNIES	CHARLIE'S ANGELS*	THE ALPHA CHRONICLES *	SIDE-STREET	A NICE SHOW LIKE YOU PU VCR	CBC NORTH LATE MOVIE*	STARDUST THEATRE (EX:VCR)
11:00	1:00							
11:15	1:15	STRUCK BY LIGHTNING						
11:45	1:45		SIGN OFF		SIGN OFF			
12:00	2:00	NEW KIND OF FAMILY				RETURN OF THE SAINT		
12:15	2:15	SIGN OFF		SIGN OFF				SIGN OFF APP
12:30	2:30					SIGNOFF		
1:00	3:00							
1:15	3:15							
1:30	3:30							

gram channel and typical programming hours are 0800 to 2300 eastern time. The eastern-Canada English language service appears on transponder 10 (4060 to 4100 MHz) and this is designated at channel **'B'** (shades of Mr. Solo!). The western and northern Canada English language service appears on transponder 12 (4140 to 4180 MHz) and this is designated as channel **'C'**.

This month's programming schedule highlights the current (October) schedule for channel 'C'; YT (far left column) is Yukon time while MT is Mountain zone time. The Programming on channel 'B' generally follows the same program sequence as that shown for channel 'C' but it is shifted in time four hours (i.e. Mary Tyler Moore appears at 1630 hours eastern on channel 'B' and again at 2030 hours eastern (1630 YT) on channel 'C'.

Reception of transponder 'A' (French) is generally sparklie free down to the Mason-Dixon line with a 12 foot antenna and 120 degree LNA from ANIK B while channels 'B' and 'C' run from 1 to 3 dB lower in level depending upon your east-west location.

FLAMES WTBS SCHEDULE

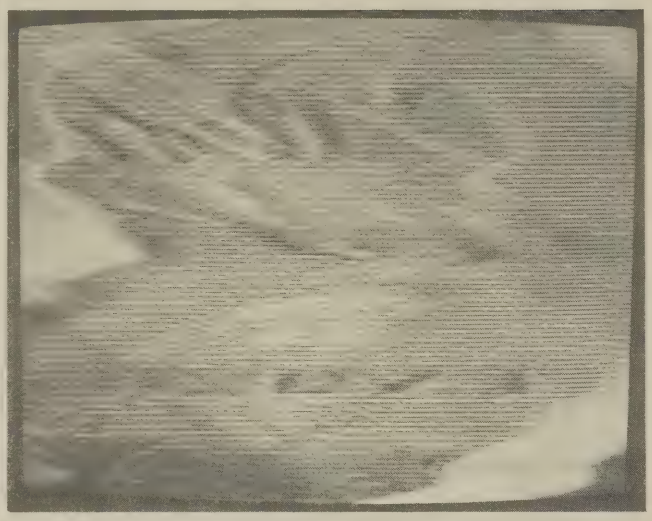
The Atlanta Fames professional hockey team will appear on 'Super 17' in 25 games during the 1979-80 season; as follows:

DAY	DATE	TEAM	EASTERN
Sat	11/3	Pittsburgh Penguins	8:00 PM
Sun	11/11	Boston Bruins	7:00 PM
Thu	11/15	Buffalo Sabres	8:00 PM
Sun	11/18	Washington Caps	7:00 PM
Sun	11/25	Hartford Whalers	7:00 PM
Wed	12/12	Edmonton Oilers	9:30 PM
Sun	1/6	New York Rangers	7:30 PM
Sat	1/12	Boston Bruins	1:30 PM
Mon	1/14	Montreal Canadiens	8:00 PM
Sat	1/19	Los Angeles Kings	11:00 PM
Sat	1/26	Detroit Red Wings	7:30 PM
Wed	1/30	Quebec Nordiques	8:00 PM
Fri	2/8	Edmonton Oilers	9:30 PM
Wed	2/13	Detroit Red Wings	7:30 PM
Sat	2/16	Minnesota North Stars	9:00 PM
Sun	2/17	Chicago Black Hawks	5:00 PM
Fri	3/7	Vancouver Canucks	11:00 PM
Sun	3/9	Winnipeg Jets	3:30 PM
Sun	3/23	Chicago Black Hawks	8:30 PM
Sun	3/30	Philadelphia Flyers	7:00 PM
Wed	4/2	New York Rangers	8:30 PM
Sat	4/5	Washington Caps	7:30 PM

PROGRAMMING PERMISSION & LICENSING

TO SCRAMBLE...

Anyone engaged in common carrier delivery services is uptight these days over the 'market security' of their services. This includes the MDS systems, the satellite delivery systems,



TYPICAL 'SOFT' SCRAMBLING - demonstrated in March of 1979 during the NAB [National Association of Broadcasters] SMARTS feed tests simply removed key sync information from the main carrier and transported it along on an unused [normally audio available] sub-carrier.

HARD SCRAMBLING WITH A TWIST - RCA's two-for-one system sends two descrete sets of video on a single transponder, interleaving lines of video from one and the other to form a double image system. Cost of decoding remains high however since pictures must be put back together at baseband on receive end by 'simulating' alternate missing lines in each picture through 'above and below' comparison.

and a form of non-common carrier service that acts for the world as if it were a common carrier; over-the-air pay television (now operating in Boston, New York/ Newark, Los Angeles, etc.).

All pay programming services have a common problem; their program suppliers. To date the program suppliers are not involved very heavily in the actual distribution of the programming (via satellite, pay-TV or MDS); rather, they are more concerned with turning out the product initially that will sell well. This leaves the burden of the security problem resting squarely on the shoulders of the actual distributor of the product; or the middleman.

There is a rich, not altogether pleasant history in the film product distribution business. The motion picture producers are a strong group politically and they maintain a substantial lobbying operation in the shadow of the nation's Capitol under the name of the Motion Picture Association of America (MPAA). This lobbying group is one of the most influential in Washington and their top banana, a former close associate of Lyndon Johnson during the Johnson era named Jack Valenti, is well paid for his efforts in D.C. In this case, well paid amounts to something in excess of $200,000 per year in salary plus fringes. A not insignificant annual take in the same realm as that received by the President of the United States; only **this president** doesn't have to worry about public opinion polls or negotiating SALT treaties!

In the MPAA mentality there must be laws and rules and regulations to protect **their** product. It was largely the efforts of the MPAA in 1974-5 and 6 that saw the ancient, admittedly outdated 1909 Copyright Law finally get reworked into a new law in 1976. A precedent was established by that 1976 law, largely created and pushed by MPAA; that precedent being that **certain television viewers** would pay a annual fee into something called 'the Copyright pot' for the 'privilege' of watching television. Those certain viewers are those homes connected to the nation's cable TV systems. Under the 1976 law, cable homes are 'taxed' a special fee for watching programs brought into the cable system from 'distant markets'. Cable systems receiving Atlanta's WTBS, for example, can be paying 1% or more of their gross proceeds into the Copyright pot for **that** channel, if they are outside of 'the Atlanta market'.

The 'Copyright pot' is administered by a bureaucracy established in 1976 along with the law and this bureaucracy is headed by something called the Copyright Tribunal. Three appointees with the power to act as 'judges' in copyright disputes sit at the top of this pile. All of the overhead of this tribunal plus the bureaucracy underneath comes out of the 'pot' and what is left over is paid out to owners of copyrights who file elaborate claims against the pot. It is something straight out of 1984 and probably could spawn and grow only in the rich soil of our nation's capitol.

The MPAA has been complaining, virtually from before the ink dried on the 1976 law, that cable systems were getting by 'too cheap'. In the MPAA mentality, TV stations who sell advertising to pay for programming don't pay enough for their programs when cable systems carry the programs to distant areas. The copyright pot is MPAA's answer to all of this and recently the MPAA top exec Valenti has been making noises of getting the annual fees raised to someplace in the 18 to 20 percentile range. That's quite a jump from the 1% region but then at $200K per year Valenti can afford to be bold and daring.

How or what does all of this have to do with satellite signal scrambling? On the surface, not very much. But if you understand the nature of the opponent, what it is he considers 'reasonable' and what he considers unreasonable, you can begin to see how folks like HBO, SHOWTIME, STAR CHANNEL et al who **depend upon** the MPAA member firms for their satellite programming fare might be quick to jump when the movie rights owners say 'jump'.

And they have said jump. HBO et al have been told, in no uncertain terms, that if the satellite programmers don't take steps to insure the 'security' of the movie products while that product is temporarily in their hands for distribution, the product is going to either (1) get very expensive to include the costs of what MPAA member firms estimate may be the illegal (as in unauthorized) reception of these movies, or, (2) become impossible to get. This makes HBO (et al) very nervous. They don't want to be charged extra fees for viewers they don't have any control over. And they certainly don't want to lose access to the movies either. As has been pointed out, where would HBO be tomorrow if the movie people cut them off from product tonight? It's kind of tough collecting $9 a month for a color bar pattern.

So HBO came along last summer and announced to its industry that it was willing to 'reward' some fortunate firm or individual who could design a 'foolproof security system' (which means a scrambling system), bring it to them, and license them for its use (or sell it to HBO). This was probably a bit of grand press-agentry designed by and large to assure the MPAA member firms that they (HBO) were going to do something positive about this 'security threat'. But even

PARAFRAME

MOST-ADMIRED AT SPTS '79 was the PARAFRAME ET/3.66 (12-foot) TVRO antenna. Those who saw us go "cherry-picking" on Day Two won't soon forget the fine reception we got from ANIK-B, while using a 150°K LNA. That's big performance and if you were there YOU SAW IT! For reception photos and product information, write or phone "Mr. Paraframe," Jim Vines.

Paraframe, Inc.
1000 Sunset Drive West
P. O. Box 423
Monee, Illinois 60449 **Phone 312/534-7435**

through the grand standing associated with the announcement one could none the less detect a tone of sincerity. Remember how much color bars are worth.

HBO, as the leader in the programming-via-satellite industry,got others thinking along the same lines. Some, such as Southern Satellite Systems who currently bring up WTBS from Atlanta, are closely studying the possibility and even the probability that they too will scramble. To protect their dime or less per month income from cable homes? No, not hardly. Back to the 1976 Copyright law.

Under the law Common Carriers (SSS is one) are **exempt** from paying into this giant Coypright pot as long as they are passing the service on through to someone else who will be or is responsible for the Copyright fees. But what if the person SSS is passing WTBS to is not responsible? Then who pays? SSS thinks that the Copyright Tribunal, given the opportunity to adjudicate the question, might say they are. And if that happened, SSS might be declared (for Copyright purposes if not for FCC purposes) a **non**-Common-Carrier. SSS can't afford that. No Common Carrier could. Scrambling may not be technically smart, but given the uncertainty of the Copyright Tribunal and how they might rule, it may turn out to be financially smart. So SSS (and one pre-supposes other Common Carriers as well) are looking just as hard at scrambling as HBO. For a different but similar reason.

Other satellite programmers without (1)MPAA problems, or (2)Copyright worries are not interested in scrambling. SSS's SPN (Satellite Program Network) is an original-for-satellite TV network. It has no copyright problems, Nickelodeon has a similar status. ESPN has a similar status. The three Christian channels have yet a third but essentially non-copyright status since they create or own most of what they televise. As the program rights owners, they have no third-party Copyright problems.

So much for the cable programmers. What about the non-cable programmers using satellite? RCA proposed to the broadcasters, in their SMARTS program which would place a gratis (RCA supplied) TVRO terminal at every broadcasting station in the country, that all transmissions would be scrambled or encoded. Not because RCA was concerned about illegal or unauthorized use; but more for RCA's convenience in selectively distributing the programming only to those stations that were entitled to receive the broadcasts. RCA characterized its scrambled SMARTS program as a way of insuring accurate **accounting** of the distribution of programming. RCA wasn't suggesting that broadcasters who were not supposed to get a certain transmission would 'steal it'; rather they were saying that by scrambling all transmissions, and only providing decoding data to the stations that were supposed to receive the transmissions, they ''wouldn't be bothered'' by its presence. A control room engineer is not apt to mis-switch to a scrambled broadcast.

Scrambling is coming. For several reasons. Some of it may be hard scrambling with a constantly changing decoding code. Other is apt to be 'soft' scrambling with a fixed key to unscrambling. Premium programmers such as HBO are apt to go the hard route; less expensive services more concerned about defending themselves before a Tribunal or in court are apt to go the 'soft' route. Scrambling will be big technical news in 1980. And the fall out from its adoption will be big software news as well.

COOP'S SATELLITE MAGAZINE SCHEDULE

Coop's SATELLITE MAGAZINE is produced by Satellite Television Technology and airs every Thursday at 12 noon eastern (etc.) on RCA SATCOM FI transponder 21 (vertical). The purpose of the weekly one hour program is to illustrate and demonstrate the latest in satellite and cable technology. Bob Cooper visits with innovators around the countryside, with the assistance of Dana Atchley, III and his mobile production facility bringing to your terminal glimpses of people and equipment that are contributing to this fast moving industry.

Program Content	Program Dates
Dana Atchley hosts with guest Wayne Kines who is involved in design and largest (and longest) rural CATV system in world; Manitoba, Canada.	10-25 and 11-01
Paul Shuch excerpts from SPTS '79 covering superheterodyne downcoversion techniques.	11-03 and 11-15
Paul Shuch excerpts from SPTS '79 covering modular TVRO receiver techniques	11-22 and 11-29
Taylor Howard excerpts from SPTS '79 covering terminal design.	12-06 and 12-13

For regular viewers, the October schedule published in last month's CSD got behind by two weeks due to a snafu at SPN. Hopefully the schedule shown here will be accurate!

SATELLITE TV EXPERIMENTERS
INTRODUCING A COMPLETE
3.7 — 4.2 GHz DOWNCONVERTER
- 3.7-4.2 GHz in, 70 MHz out
- Remote, one control tuning
- Dual conversion - stable
- Assembled & tested Only $895.

Polar Mount and Remote Feed Rotation
Plans For Your Dish
SUPER! $10.00 postpaid

THIS PRODUCT NO LONGER AVAILABLE

EXPERIMENTERS SUPPLIES
- Teflon PC Board Material Constant 2.55
  1/16''x9''x5'' (approx.) $10.00
  1/32''x9''x4'' (approx.) $10.00
- Chip capacitor kit 12 each, 60 total! 18, 27, 39, 220, 4700 pf... only $18.00
- SMA and microwave connectors, inquire
- 2''x14'' copper tube for Birkhill feed, 3 lbs. $12.00

WRITE - We are adding to our inventory!

SATELLITE INNOVATIONS
P. O. Box 5673
Winston Salem, N.C. 27103

Add $2.00 shipping and handling (except for plans)

PROGRAMMING CORRESPONDENCE

FOR YOUR EARTH STATION, CHOOSE
AVCOM'S PSR-3
SATELLITE VIDEO RECEIVER
DESIGNED FOR YOUR PRIVATE TERMINAL
- Remote tuning
- Dual video outputs
- Exclusive Clamp-Sync & Scan-Tune
- Many other features!

AVCOM of Virginia, Inc.
10139 Apache Road, Richmond, VA 23235
(804)320-4439

MDS ET AL

Your announcement of SPTS '80/Miami says that you intend to cover the subject of inter-connecting a satellite receive terminal to the local area through 'low power re-broadcasting equipment' or systems. Does this refer to MDS, scrambled UHF/VHF translators (are they legal yet?), 10 GHz relays or a combination of the above; or an entirely new subject? I am considering making just such a move in a small community out west and would like to know which is the most cost effective means of accomplishing it.

Jim Barbre
Baton Rouge, LA 70805

Here in the United States, the only legal way to accomplish through-the-air re-distribution of a TVRO signal is via MDS. Most MDS systems [operating as FCC licensees in the 2.15 GHz region] do not scramble; they use standard NTSC format with AM video and FM audio and 'depend' upon the fact that they are operating on a 'microwave band' for their 'security'. A couple have gone into scrambling in markets such as Houston and Chicago, largely in response to the ready availability of do it yourself [or black market] receiving systems available there. Outside the U.S., Canadian David Brough is transmitting scrambled VHF signals fed alternately by either video-tape or satellite to far northern Canadian communities [for a fee of course]. In the Caribbean, Central and South America, one of the most popular systems is to transmit the video/audio signals back out in a portion of the UHF band (typically below channel 14 at 476 MHz but above 400 MHz) **where a standard UHF TV tuner cannot pick it up, and then sell or rent or lease down converters to the customers [sort of a lower frequency MDS approach]. Bob Behar at A-B Electronics** (1783 West 32nd Place, Hialeah, FL 33012) **is the U.S. expert on the 'low frequency MDS' approach; but understand it is not licenseable in the U.S. because there are no frequency allocations to support it.**

AUSTRIAN TV DIRECT?

I lived in Europe for several years and I would greatly appreciate being able to pick up German and Austrian TV programs. Have you heard of anyone in the states who has picked up European TV relayed by satellite?

J. Rozenbergs
Roanoke, VA 24019

Those people familiar with the U.S. and Canadian DOMSAT [domestic satellite] system[s] often have the mis-conception that international satellites are simply more of the same good stuff; except in a foreign language. At the moment this is not the case. INTELSAT birds (see your handy dandy 'Worldwide Communications Satellites Wallchart available from STT for $10 per copy) **are programmed with two types of television material. Some of the African and middle eastern countries [but not Germany nor Austria in either case] lease space or transponder time to relay internal to their country television from typically their capital to one or more outlying regions where regular VHF or UHF TV transmitters rebroadcast the programming over a typical terrestrial coverage area. These INTELSAT relayed transmissions more or less fit our DOMSAT operating modes in that the programs are regularly scheduled, and the programming runs sequentially through the normal broadcast day. However, most video on INTELSAT is more akin to the WESTAR II or SATCOM FII video in that only parts of programs [as fed back to network headquarters] or single programs are relayed. They run through the satellite[s] at a time that suits all parties involved, seldom when they are being shown simultaneously via terrestrial rebroadcast stations. Undoubtedly from time to time portions of German or Austrian TV programs are so relayed [the INTELSAT system merely serves as a relay system] but to be able to sit down and watch the TV you are after on a regular,** scheduled basis **is not possible. The Germans do expect to launch in the 1982-83 period a DOMSAT of their own which will function as our FI and ANIK birds function; relaying a** full **broadcast day. However, this will be in the 11/12 GHz downlink region using carefully shaped antenna patterns designed to cover** only **a small portion of Europe and even if the 11/12 GHz bird was to be positioned on the geostationary orbit belt so that you would have above-the-horizon visibility of bird, you would here in the states be so far down on the antenna pattern that the chances of being able to receive it would be slim at best.**

FCC DISMAY

In Bob Cooper's 'New Frontier' column in the October (1979) QST, he states that the FCC is now 'routinely granting private (as in noncommercial) home satellite earth terminal licenses'. Since I do not want to pay a visit to a federal courtroom, I decided to call our local FCC district office here in Seattle. The engineer-in-charge informed me that the only application forms known to him were for commercial installations and are very lengthy and detailed. This did not sound like the licensing that Coop made reference to. I then talked with Bill Lombardi at the Common Carrier Bureau at the FCC. He stated that the FCC does not have any sort of application form for the 'backyard TVRO terminal'. I would greatly appreciate any further information on this matter.

Craig Jobest
Marysville, WA 98270

Sometimes these questions are just a matter of timing. The district FCC offices are typically the last to know what has been approved [or dis-approved] in Washington. That is the nature of the overwhelming amount of paperwork created by the FCC in D.C.; getting that data to 24 or so field offices in a format that can be quickly digested by over burdened field engineers is difficult at best. The FCC is of course 'routinely granting' private (as opposed to commercial) **terminal licenses; at the time you called Bill Lombardi the only way they**

were doing that was via the commercial licensing route. The approach Coop took nearly two years ago was to obtain an experimental or developmental license under subpart E, section 25.390 of the rules. Licensed as WF-92, Coop has had to battle constantly to hold onto that license in the face of opposition from all sorts of groups intent on landing him in a federal courthouse! Under the FCC's deregulation policy (which hopefully we are announcing in this issue) **a clear cut procedure for 'backyard TVRO terminals' is evolving.**

COMING TO VISIT

I am so turned on by the whole concept of satellite television that I can hardly contain myself. Unfortunately I spend six months or so a year on an oil rig off the coast of Brazil, with alternate periods of Brazil and then being home in Texas. The Howard, Coleman and Swan manuals plus CSD help me keep up the interest while off the Brazilian coast but when I get back from this work period I intend to come to Oklahoma City to see you all!

Jimmy Hale
Daisetta, TX 77533

This might be a good spot to discourage **dropins at the Coopers. We love all of the loyal satellite TV fans and sincerely appreciate the support we have received in getting this new industry off the ground. With the explosive growth however has come 20 hour work days and a barrage of telephone calls and mail that is increasing at an expontential rate. Better you should come to an SPTS gathering where you'll have an unfettered opportunity to sit down and visit with the** real **pioneers in this business like Shuch, Howard, Coleman and Swan [to name four that pop to mind].**

TAPING MOVIES

In light of the recent California court decision wherein it was found that SONY and other defendents were not guilty of violating U.S. Copyright laws by allowing or encouraging or engaging in the videotaping in one's home of programming broadcast over television, I don't understand how everyone can continue to be uptight over home reception of satellite signals! I don't think that the FCC's section 605 would stand the test of a court case. If the FCC thinks they could make this stick, why don't they go after the Russians who are monitoring our common carrier transmissions at embassies and in the sky all over North America? It appears to me that the 'limited access' broadcasting people (MDS and STV) have gotten themselves into a bind; they are a victim of their own popularity. My own feeling is that as long as people build their own terminals and view these transmissions quietly in their own homes there won't be much of a fuss created. I would expect the commercial organizations to 'write off' the extremely small number of people engaged in this sort of thing. However I would expect any efforts to sell the services to others outside the privacy of the home to be quashed very quickly. The only real solution to all of this is for the whole transmission system to switch to cable where wiretapping laws would preclude unauthorized access!

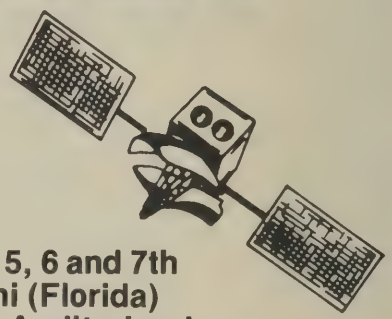
Malcolm Crawford
Lexington, MA 02173

Readers should not confuse the California SONY/ Disney-MCA court decision with the question of common carrier viewing. The California court did not address this issue at all, but it did make several observations about even sharing videotapes made in the privacy of your home with others. See COOP's COMMENT ON PROGRAMMING in this issue of CSD.

SLEEPLESS NIGHTS

I am a little late in writing this letter to thank you for the outstanding SPTS sessions in Oklahoma City. The one thing that I would strongly recommend for all future meetings that SPTS will have is to retain the ability to videotape all of the sessions as you did in Oklahoma City. This, as far as I am concerned, made the trip and expense worthwhile. As I am

SPTS 80 MIAMI



FEBRUARY 5, 6 and 7th at the Miami (Florida) Bayfront Park Auditorium!

MORE THAN 25 SEMINAR SESSIONS jammed into three activity packed days. H. Paul Shuch, Taylor Howard, Oliver Swan, Robert Coleman and nearly a dozen other 'satellite-innovators' will teach the latest in low-cost satellite TV technology.

SPECIAL SESSIONS AIMED AT MARKETING the satellite TV service to rural residents of North, Central and South America. A special session devoted to reception techniques required in the far eastern caribbean, and Central America; a separate session (in Spanish!) to teach reception techniques and requirements in northern South America!

SPTS '79 WAS A SELL OUT. Registration forms are now available for SPTS '80/Miami. Each registrant will have the option of receiving the Howard, Coleman and Swan TVRO system manuals as a part of his registration package. Come to SPTS '80/Miami and learn all about the low-cost satellite TV revolution, what it means, and how to be a part of it. Call or write for your registration forms now ... don't be left out when SPTS '80 fills up!

SPTS '80 / MIAMI

Write: SPTS '80/Miami
P. O. Box G
Arcadia, Ok. 73007

Call: Satellite Television Technology
(405) 396-2574 between 9 AM and
4 PM central time weekdays.

sure you realize, there was simply not enough room in the Paul Shuch sessions for all of us to attend and the videotape replays made a big difference. At the present time I have located a ten foot parabolic antenna and I have designed and built a polar mount. Anyone who would like to see it (constructed from common 3.5 inch water pipe) is welcome to do so. Since I read your first article on TVROs I have spent many sleepless nights. I am not sure whether I should cuss you or praise you. When I get my system totally up and operating I'll let you know which it turned out to be!

Gay M. Hamilton
17381 Roseleaf Ave.
Tustin, CA 92680

Videotaping in Miami is going to be a bear; **but we have a positive attitude at the moment and are working on it. We are in a commercial convention center at the Bayfront Park facility in Miami, and unlike the fantastic facility in Oklahoma City at South Oklahoma City Junior College where the whole place was 'wired for TV' we are going to have to figure out a way to establish a distribution system for those who will** (IF we work it out) **be able to plug in for dubbing the proceedings. If you think you have sleepless nights now Gay, wait until the terminal is operational! Super-17 never signs off and by the time dawn is breaking in L.A. the eastern based premium service channels such as STAR CHANNEL are starting their 9 AM [in the east] features again.**

BIRD OPERATIONAL NOTES

Direct to home broadcasting satellites in 4 GHz [C] band may not be dead issue yet; although outcome of WARC talks still underway will have plenty to say about ultimate configuration. RCA Prexy Edgar Smith has told Geneva delegates his company would support system consisting of three clusters of 4 GHz birds designed to provide C band video services to homes; clusters proposed would service (1) North and South America, (2) The Pacific plus Asia, and, (3) Europe, Africa and middle east.

INTELSAT, meanwhile, has announced it will make 'extra' transponder capacity on new V birds on both C and Ku bands available for 'domestic' systems. Transponders to be available will go for $1M per year (comparable to U.S. domestic bird rates) but in Global beam configuration which is where rub begins. Global provides 22 dBw over 40% of earth's surface, wide coverage but levels 10 to 15 dB below domestic birds now operating (in C band). INTELSAT already has long list of domestic (intra-country) users including: Algeria, Brazil, Chile, Columbia, France, India, Malaysia, Nigeria, Oman, Peru, Saudi Arabia, Spain, Sudan, Uganda, Zaire. Australia, Egypt and Greenland (fed from Denmark) will also start soon; China has shown big interest. All present users employ big $2M terminals (if transmit **and** receive), typically 15 meter antennas.

National Public Radio (NPR) has begun regular WESTAR I service on transponder 6 to affiliates equipped with 4.5 meter dishes; more than 100 terminals expected to be operational with four channels of eventual service before 1 January. ABC radio network latest to task for domestic bird birds on network via satellite for 1,600 affiliates. Service would be for all four ABC sub-nets, stereo service, although audio may be transmitted in digital format.

Future of Canadian cable systems (which received government permission to use ANIK satellites last spring) use of bird continues muddled. Latest proposal calls for Hamilton, Ontario station CHCH to become 'national network feed' for satellite service. Talks now underway.

Controversial COMSAT proposal to fund and operate six transponder, scrambled Ku band domestic service, satellite(s) now scheduled to be formally presented to FCC next February. Opposition to service is mounting.

SBS, tied up in court over operating its own satellite system, has begun tests with fulltime transponder lease from WESTAR. Stations owned by a firm in Poughkeepsie (N.Y.), Los Gatos (Ca.) and Raleigh (N.C.) now interconnected.

Good news for Caribbean, northern South America and Central American would-be viewers of domestic (U.S.) birds. More and more video showing up on COMSTAR, especially III at 87 degrees west. Transponders 4,8,12,16,20 and 24 boresighted just SW of Puerto Rico place 32 dBw **or better** signal over all of Cuba, southern Mexico south to northern Columbia and Venezuela and all of central and eastern Caribbean. Recently CBS, ABC and NBC programming has been carried near-full-time in this transponder set. Reception tests in Dominican Republic indicate 16 foot antenna with 120 degree LNA produce video 'well above' sparklie level; 120 with 12 foot might still make it.

SIN's GalaVision service for Hispanic speaking peoples was scheduled to begin October 26th sub-letting on transponder 18 from Reuters. Uplink (S/A 10 meter) installed in Hollywood. **Reuter's** digital service on 18, meanwhile, is now officially available to 'private terminal operators'. Price tag of $900 per month (you read right!) will include London Gold Market reports. Oh yes, hardware adaptor will set user back an additional $5,000.

Merger of Microdyne and AFC (Antennas For Communications) has a message for private terminal users. New firm will be able to supply everything but LNAs from own facilities and Microdyne portion has announced they will place $10,000 (or under) 'home terminal' into marketplace around 1 March of 1980. Microdyne has been large supplier of commercial (primarily CATV) receivers; AFC has been offering 5 meter fiberglass antennas for CATV market for nearly 18 months and has been primary supplier of 'horn' type antennas for satellite reception since inception of service.

Ted Turner's **WTBS** has begun deleting some strictly 'local' commercials from satellite feed, substituting PSA (public service) announcements. Nobody at FCC seems sure whether this is legal. Turner intends to eventually replace the dumped local (car dealer, carpet dealer, etc.) commercials with national advertising (Coca Cola, etc.) if 'test' survives FCC and other flack. **ESPN**, which launched September 7th on transponder 7 with 24 hour per day sports, now claims 4.5 million cable homes serviced. Public service programmer **Appalachian Satellite Network** is beginning 35 hour per week service via SATCOM (I now, III later) with nearly 50 (CATV and other) terminals set up to take service; primarily in Tennessee, Kentucky, West Virginia, North Carolina, Virginia, Maryland and Pennsylvania. **SIN**, to attract cable systems to normal service (not GalaVision) is offering to pay cable systems around $1.00 per 1,000 Hispanic sur-named homes reached per month as part of its 'advertising revenues'. This is the first satellite service video offering to offer to pay cable systems for carrying service even if rate is miniscule.

PBS documentary (8 PM, November 12th) titled "Real War in Space" focuses on anti-satellite weaponry.

PROMOTIONAL DATA AVAILABLE

ALTERNATE INFORMATION SOURCES

For those fans of everything written about satellites, here is a current listing of where to go to find our more (or less) than you already know.

73 MAGAZINE - The current (November) issue is **scheduled** to carry a 13 page article written by Coop last spring describing why every ham radio operator should immediately drop everything and start building his own private TVRO. Basic material never goes out of date, some of the recent changes in bird operations are not reflected because of the long lead times between writing and publication. Contains some information not previously published and is therefore worth running down.

RADIO ELECTRONICS - The popular six or seven part series that ran through part-three in the October issue will resume (we are told) with their January (1980) issue. It should run continuous for four more issues, covering the Swan Spherical antenna construction (but certainly not as thoroughly as the Manual!), a hybrid receiver built around the Coleman GaAs-GET LNA, the Coleman VTO-8360 LO source and active mixer, and the Howard 70 MHz i.f. and demod circuits.

ENTREPRENEUR MAGAZINE - A very expensive, how to get wealthy in business for yourself publication, is scheduling an interesting look at the business opportunities presented by the private satellite television explosion in their December 1979 issue. This publication with around 200,000 circulation looks for business and investment opportunities for the 'independent person' and you have to be very clever to even find a copy on a newsstand. Their address is 631 Wilshire Blvd., Santa Monica, CA 90401. Same issue also looks hard at the business opportunities offered by MDS (now that's a sharp magazine that sees the connection between the two!)

PRIME TIME SUNDAY - The exact scheduling of the 9 to 10 minute piece largely 'shot' at SPTS '79 in Oklahoma City remains up in the air but there is a fair chance that it will appear on either Sunday November 25th or Sunday December 2nd. During early November the Prime Time crew will be shooting some 'holes' that appeared in the piece after the editing began including at least one interview with an FCC official in Washington (who can guess what he will say!) and an 'over the shoulder' look at somebody's terminal receiving some of the 'forbidden fruit' that everyone knows (but NBC!) that you are not supposed to watch. If you want to play a guessing game, CSD will think up an appropriate prize for the first person (other than himself and relatives) to correctly identify the mysterious 'over the shoulder' camera subject who takes the NBC crew through a set of forbidden fruit pictures.

SYSTEM PACKAGING NEWS

COOL IT

Those with either a long memory or a significant collection of the 'old' CATJs may recall that in the April 1978 issue a fair amount of space was devoted to the subject of (commercal) LNA design and application. The subject of that particular in-depth look at LNAs was Scientific Communications, Inc.; one of the better quality LNA houses about. And in that report an SCI engineer talked about what might be done to improve the 'noise figure' performance of an LNA by applying cooling to the LNA.

The LNA is temperature sensitive. Or to be more precise, the GaAs-FET (noise figure establishing) transistors in the front end of an LNA are noise contribution dependent upon their operating temperature and the operating temperature of the circuit they are functioning in. Logic has suggested for some years that if you could build a refrigerated container around the LNA and stow the LNA in the container, maintaining a lower ambient temperature inside of the container than one has outside in the air, that the performance of the LNA would improve. The magic numbers are that you can lower the noise temperature (do not confuse **noise temperature** with LNA **operating temperature**) 0.5285 degree(s) Kelvin for every 1 degree C drop in ambient (operating) temperature. Which is another way of saying that the LNA will perform better (i.e. have a lower Kelvin noise temperature) if you would install it at the north pole, than it would have at the equator.

For example...take a standard 120 degree K LNA operating at its spec-rated 77 degree (F) ambient (air) temperature. The noise factor (K) will be the rated 120 degrees. Now cool off the LNA (the whole LNA) to 50 degrees F. The K noise temperature will now be 112 degrees. Lower it to 30 degrees F and the K noise temp will now be 106 degrees. At 10 degrees F the K noise temp will be 100 degrees while at 0 degrees F the K noise temp will have dropped to 97 degrees.

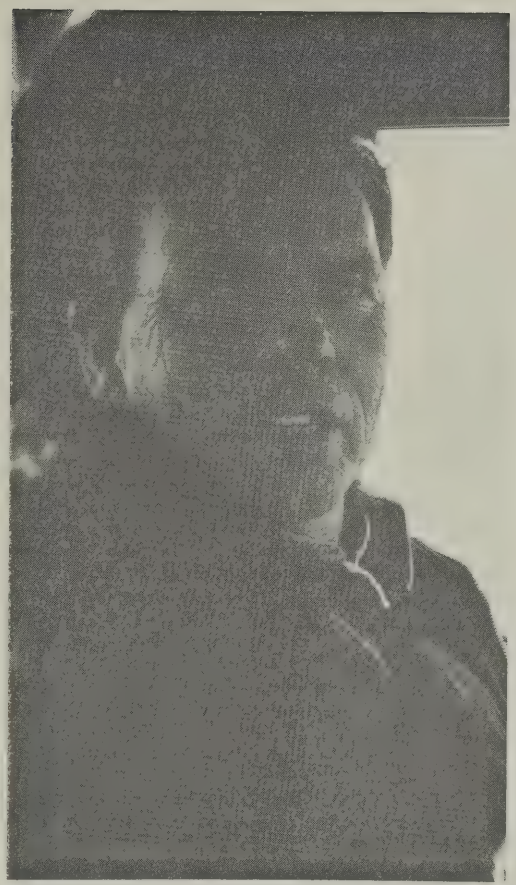
If you could turn a 120 degree rated unit into a 100 degree rated (K noise temp) unit by cooling it (with refrigeration of some sort), and you could cool it for less cost than the price difference between a 120 degree unit (call that $1400) and a 100 degree unit (call that $2800), it might be worth looking into.

Actually a few experimental terminals have built their own cooling systems, but they by and large have been bulky and not easily duplicated systems. Enter now (finally!) a commercial approach to the problem.

B&E Industries (410 Kirby, Garland, Texas 75042; attention Nick Rognlie) has been field testing a series of LNA cooling systems that Steve Vetters of Southern Satellite Systems in Tulsa reports "really helps clear up the sparklies on a 100 degree LNA installed on an 8 foot dish". The device is a housing that fits over the LNA (they have to know the dimensions of your LNA and the mounting system you are using before they can supply a unit). Using a heat pump principle, the system is capable of reducing the effective ambient temperature of the LNA by around 30%. That suggests that on a day when the temperature is 80 degrees F that with the cooling system installed the LNA 'thinks' the temperature is about 56 degrees. And that suggests that a 120 K LNA would become a 113 degree LNA under this circumstance. The cooling system (heat pump) operates on 12 volts and draws between 3 and 4 amps.

OLIVER SWAN–

talks about Spherical TVRO antennas.

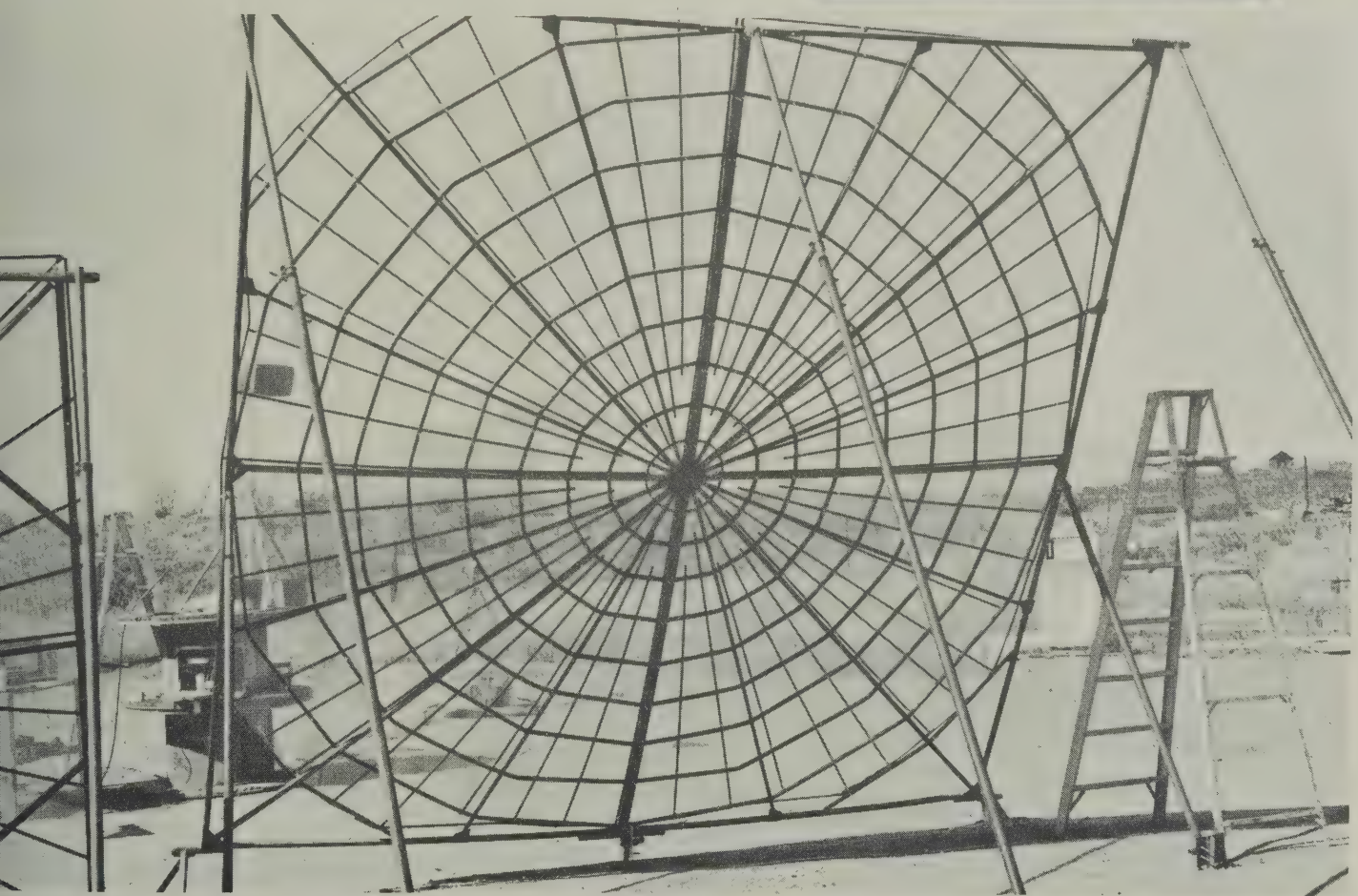


Oliver Swan's antenna exploits are legendary. And now he's done it again. A complete series (from ten feet to as large as you want or need!) of 'Spherical' antennas for simultaneous reception from up to 9 geostationary satellites spaced at 4 degree intervals!

Extensively tested by TV stations, cable companies and a major TV network, the Swan Spherical series of TVRO antennas are lightweight in design, quick to install, and have low wind loading because of the mesh relector surface recommended. The Spherical has many advantages over normal parabolics, including the multiple-satellite visibility. **AND** - they are far less expensive than comparable 'full dish' parabolics!

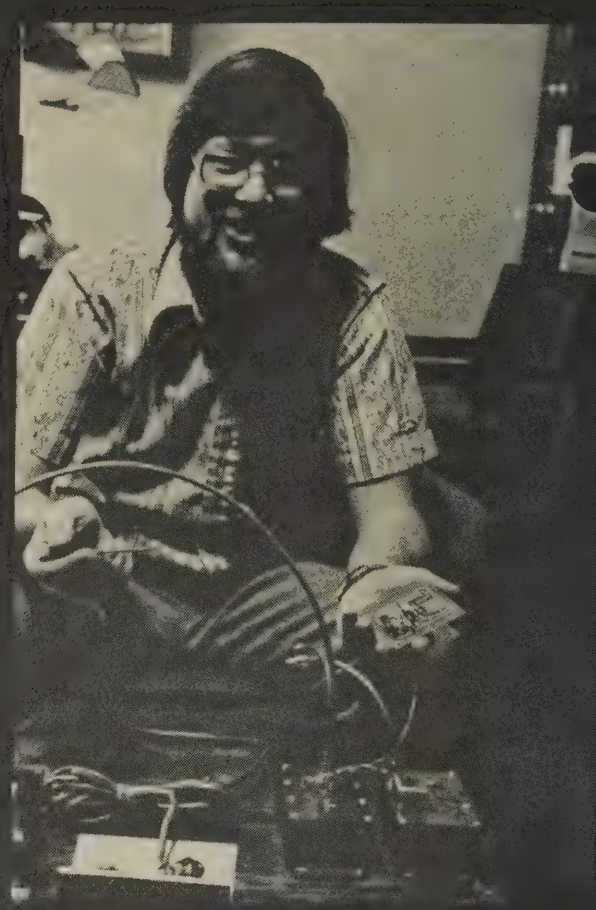
Best of all, **you can build it yourself**. Using locally available materials and local labor. The **SWAN SPHERICAL TVRO ANTENNA MANUAL** tells you how. In detail. Complete construction information on the Swan Spherical antenna series and the 'deep throat' feed horn is yours for the paltry sum of $30. With this instruction manual, around $300 in materials and approximately 40 hours of construction time you'll have a ten foot Spherical up and running.

The **SWAN SPHERICAL TVRO ANTENNA MANUAL** is another in the series of "learn-by-doing-manuals" available exclusively through Satellite Television Technology. The price is $30 postpaid in U.S. and Canada; $35 elsewhere. Order your copy today from the STT address appearing below.



SATELLITE TELEVISION TECHNOLOGY
P.O. BOX G
ARCADIA OK 73007 (405)396-2574

SPEND 8 HOURS WITH H. PAUL SHUCH



H. PAUL SHUCH will give you an important 'leg-up' on microwave and satellite TV technology. In eight lectures (originally conducted for SPTS '79) he takes you through TVRO (1) Antenna and LNA Selection, **(2)** Superheterodyne Down Conversion Techniques, **(3)** Modular Receiver Design Approach, **(4)** Scattering Parameters, **(5)** Analytic Amplifier Design, **(6)** TVRO Test Equipment and Procedures, **(7)** Baseband Processing Systems, **and, (8)** TVRO System Summary. **This eight-lecture series is the perfect learning tool for teaching yourself, your class or your employees all about the basics of satellite TV reception techniques!**

The Shuch Satellite Symposium videotape series is available on VHS (LP) or BETA (BETA-2) format videotapes in a learning package. Paul Shuch is a frequent contributor to many microwave publications including the Proceedings of the IEEE. This eight-lecture series was videotaped live before the SPTS '79 overflow crowd in Oklahoma City this past August. Paul has an easy going, down-to-earth manner to carefully guide even the most inexperienced microwave hand through the complexities of microwave based satellite TV reception system design. There is no finer, or easier method of learning what you and your people need to know about the world of microwave TV reception. Order your special SHUCH SATELLITE SYMPOSIUM set of videotapes today.

_____ **SEND US THE LECTURE SERIES ON VHS** (LP) color videotape. Our check for $210 is enclosed (add $10 in Canada, Mexico; $25 elsewhere).

_____ **SEND US THE 8 LECTURE SERIES ON BETA** (BETA-2) color videotape. Our check for $225 is enclosed (add $10 in Canada, Mexico; $25 elsewhere).

NAME _____

COMPANY / SCHOOL (if any) _____

ADDRESS _____

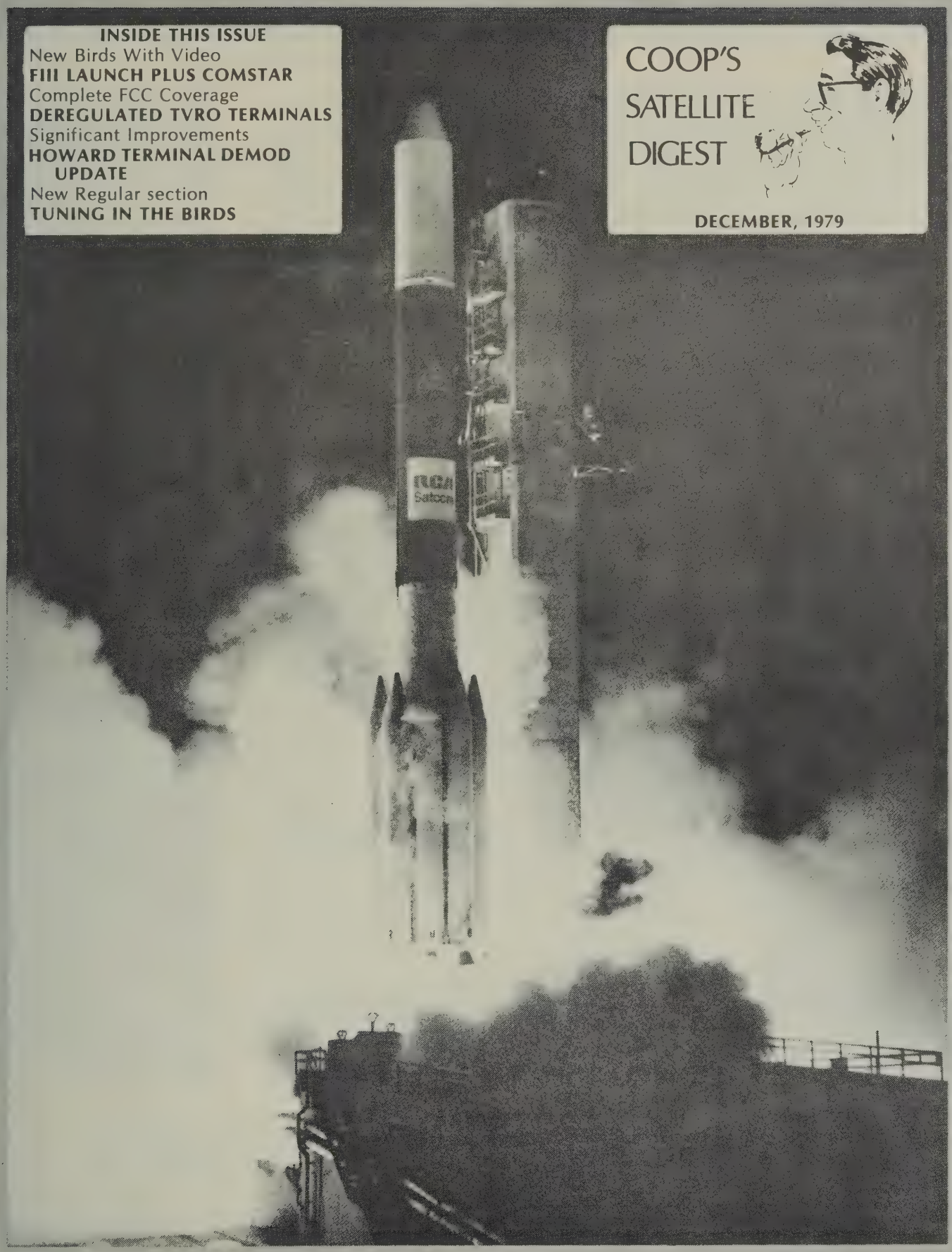
TOWN / CITY _____ STATE _____ ZIP _____

Enclose payment with order to:

SATELLITE TELEVISION TECHNOLOGY
P.O. Box G
Arcadia, Oklahoma 73007

H. PAUL SHUCH
Satellite Symposium
Lecture Series
Videotapes Are
A Product of
STT

Satellite Television Technolo



INSIDE THIS ISSUE

New Birds With Video

FIII LAUNCH PLUS COMSTAR

Complete FCC Coverage

DEREGULATED TVRO TERMINALS

Significant Improvements

HOWARD TERMINAL DEMOD UPDATE

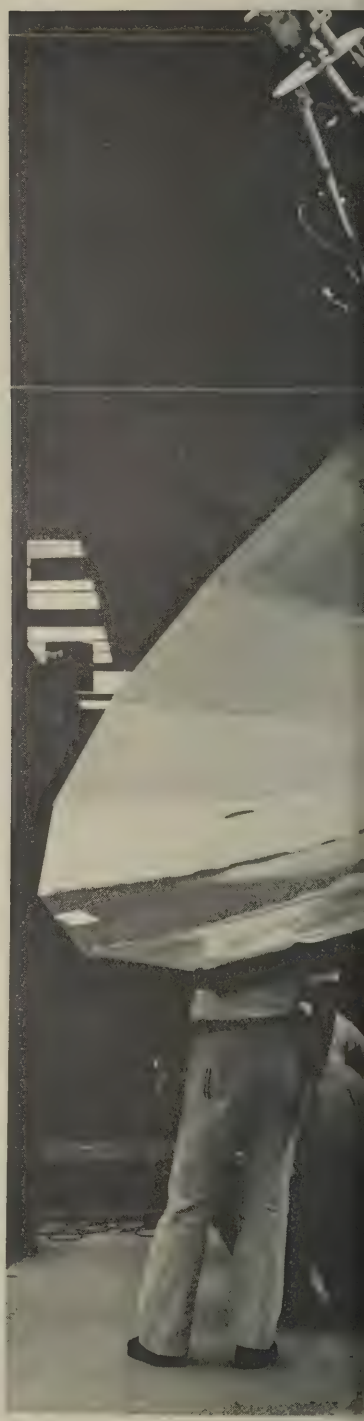
New Regular section

TUNING IN THE BIRDS

COOP'S SATELLITE DIGEST

DECEMBER, 1979

PARAFRAME



MOST-ADMIRED AT SPTS '79 was the PARAFRAME ET/3.66 (12-foot) TVRO antenna. Those who saw us go "cherry-picking" on Day Two won't soon forget the fine reception we got from ANIK-B, while using a 150°K LNA. That's big performance and if you were there YOU SAW IT! For reception photos and product information, write or phone "Mr. Paraframe," Jim Vines.

Paraframe, Inc.
1000 Sunset Drive West
P. O. Box 423
Monee, Illinois 60449

Phone 312/534-7435

COOP'S COMMENT ON TECHNOLOGY

THE DOWNLINK SPIRAL

The hardware market for 'small' (or 'low-cost' or 'home') TVRO terminals is in a period of considerable adjustment. The trend is downward, but the direction of travel is faltering, halting from time to time as new innovations come along to temporarily push the 'base pricing schedule' back up again.

Fellow technologist H. Paul Shuch and I were talking one day late in October. **"Why don't you plant a controlled 'leak' in CSD telling people you think there will be $1,000 home receivers on the market by mid 1980?"** asked Paul. It happens I agree with Paul that this price range is certainly feasible by say 12 months from now, but I'm not sure the market is ready for that kind of bottom-line pricing just yet. It may be that the engineers are working overtime and in doing so they are outpacing the marketeers.

The average man in the street has no idea what satellite television is. In spite of my own prolific writings we've hardly scratched the surface yet. Satellite TV is hardly a household word.

Chuck Colby at Microwave General tells me that their $9,900 turnkey installed super deluxe terminal systems are selling better than their $6,900 bread and butter terminals. "The people who have that kind of extra money hanging about are not quibbling over an extra $3,000; they want a terminal with all of the bells and whistles" notes Chuck. I think he's right. The marketplace today is the 'video nut'; the individual with lots of disposable income who views a private (home) satellite terminal as just another expensive space age toy. This chap probably already has a couple of home VCRs, a wide screen system, a home color camera and loads of periphereal gear. He is looking for the 'ultimate video experience' and he hopes that satellite TV will be it. Microwave General's super terminal with easy chair operated remote control of the antenna's azimuth, elevation and polarization rotation gives him access to everything in the sky. **This customer** is not going to be satisfied with anything less.

The missing ingredient is marketing. Manufacturers of small terminals are typically smallish companies with a handful of employees all wearing two or three hats. There is very little professionalism in the market (few indeed even have advertising programs) and very few even understand the distributor/dealer system. Their fame spreads largely by word of mouth which was fine in ancient Rome but hardly adequate today. The exception to this statement is Scientific Atlanta's HOMESAT division and to some extent Cliff Gardiner's multi-layered Houston operation. But even with these two exceptions, there is not the kind of national, razz-ma-tazz marketing that one would expect from Sony, or Panasonic or Channel Master or Winegard.

So to this point the 'market' is not even price conscious because by and large the market is not yet aware of the product's availability. Or the service itself. There is a large amount of spade work to be done here and perhaps through some mutual efforts those suppliers with an interest in making the market more viable will spend some time discussing this in a mutual way during SPTS '80 in Miami; come February.

In spite of the lack of awareness and marketing appeal (or the appeal **of** marketing), Paul Shuch is probably correct. A $1,000 receiver is certainly possible by this coming summer. The germ for it already exists. You take Robert Coleman's one or two stage GaAs-FET front end (the ultimate decision between one and two stages is yet to be made), marry that to Coleman's active mixer that produces a 70 MHz i.f. and then jump horses to the latest Tay Howard 70 MHz i.f. strip and video/audio demod circuits (see Technical Section of this issue). There are three or four expensive components here; the GaAs-FET (2 or 3 required) and the VTO-8360 VCO. Both items will drop in price sharply the first time some substantial company waves a 10,000 per annum purchase order in the right direction. A $40 GaAs-FET and a $50 8360 are certainly practical at that quantity level; and the balance of the full receiver will cost far less than the combined costs of the GaAs-FET and VCO parts. Additionally, there is nothing to cause either pricing to freeze at the 10,000-per-annum level; $20 GaAs-FETs and $20 VCOs in the 100,000 per annum region are distinctly possible.

None of this will happen in a short cycle however. Before any 'substantial company' will make this type of commitment, there will be 'water testing' and 'market exploration' with smaller quantity, higher priced packages. Even **after** the decision is made, there is the inevitable turn around time while GaAs-FET and VCO suppliers learn how to move from 100 per week to 100 per hour production rates.

So while H. Paul Shuch may well be correct that **engineers** will be ready to produce $1,000 end user price range receivers by this coming summer, we seriously doubt the balance of this new, fledgling industry will be ready to manufacture or market them. On the other hand things tend to happen very fast in this business and as Tay Howard likes to note "everything is on pins and needles waiting for the first BIG buy". When it happens, all of the rules of the game will change and the home satellite industry will be off and running in a big way.

CSD TECHNOLOGY

COOP'S SATELLITE DIGEST (Technology Edition) is produced monthly by Satellite Television Technology, P.O. Box G, Arcadia, Oklahoma 73007 (405-396-2574). CSD is available in two separate editions (Technology and Programming) or as a combined subscription. Subscription rates are $30 per year for first class mail delivery within U.S.A. or Canada for either edition, or $50 per year for the combined editions. Outside U.S.A. add $25.00 per year for any subscription. All subscriptions to be paid in advance in U.S. funds drawn on a U.S. bank; no invoicing. Contents are copyright 1979© by Satellite Television Technology and any duplication or reproduction in any form without written permission is a violation of Federal Statue (17 USC 101 et seq.).

RCA FIII and COMSTAR

NEW BIRD FORMATS

A stage of transition is rapidly approaching the North American domestic satellite services. RCA's third (FIII) bird is scheduled for launch from Florida's east coast launch area about the time you read this material and while this third 24 transponder RCA satellite will increase by more than 50% the actual RCA transponders available for operation, the three ATT/GTE operated COMSTAR birds located at 128, 95 and 87 degrees are taking on new importance in the scheme of things as more and more video shows up on these formally non-video birds.

Starting in this issue of **CSD** in the Programming Section readers will find a listing of transponders in use for video services on all of the North American domestic satellites. This information, supplied by terminal operator/readers, is designed to assist you in your own equipment alignment and maintenance.

While RCA FIII is scheduled for launch early in December, the mystery as to which service will actually be operating on what transponder continues. RCA is understandably reluctant to release such information until FIII has achieved geostationary orbit and completed initial flight check outs. This suggests that perhaps before the January **CSD** goes to press, but in any event a month or more prior to the actual activation of FIII, this information will become available; and we'll have it here for you at that time.

THE FACTS

RCA's FIII is the same generation satellite as the present FI and FII birds. A 10% increase in battery capacity (over FI and II (plus a small similar increase in hydrazine fuel kept on board for manuevers during the life of the satellite are improvements made to the system. Additionally, RCA has retro-fitted the FIII bird so that there are four in-place 'spare' TWT (traveling Wave Tube) amplifiers on board. There spare output stages are configured so that by ground command they can be remotely switched into operation to replace short-life TWT's that may develop on FIII as time goes on. RCA talks in terms of a seven to ten year life for FIII, up perhaps 25% from similar estimates of FI and FII life prior to their launches.

Neither FI nor FII are operating at full capacity. On FII, where the first heavy concentration of cable programming began in 1976, transponder 12 has been defunct for quite some time and others have shown signs of erratic behavior. **FII** has had a solar panel tracking problem from the day it was launched and to this day RCA engineers continue to 'hand crank' the solar panel backwards through a 340 or so degree rotation once per day to avoid a 'high friction/torque' zone on the solar panel rotation system. FII has also exhibited erratic attitude problems on several occasions; the most recent being this past September when the bird decided to seek its own boresight and failed to respond properly to earth uplink commands properly for a short period of time. **FI** has apparently had a defective transponder 4 from the day it was launched; transponder 13 is either dead or so erratic as to be not usable. There have also been some TWT problems with FI with unexplained reductions in downlink transmitter from time to time on several transponders.

FIII is to be known formally as "the cable TV bird". With 24 brand new transponders and a back up of four extra TWT output stages, FIII is prepared to provide the cable industry with no fewer than seven and perhaps as many as ten years of service. FIII will locate at 132 degrees west. All RCA SATCOM birds employ multiple up and downlink antennas on the bird. RCA groups transponders by sets of six channels per transmit antenna and the theory has been up to this point that the four separate transmit antennas (on FI and FII) could have slightly different boresight ptterns to favor transmission to various portions of the North American area. For this reason some transponders (on FI) have stronger signals into your area than other transponders on the same bird. The most varied boresight patterns are found on FII where one set (3, 7, 11, 15, 19 and 23) is so skewed that it is of no real value east of the Rockies (Chicago is lower than 30 dBw).

Most people expected FIII to follow that format but RCA's official data on file with the FCC suggests they have other plans. **See map number one.** This map is for **all four** of the antenna sets according to the Commission filed data; there is not expected to be any wide (if in fact measureable) difference between the various antenna/transponder sets with FIII. Now how does this **projected** EIRP contour stack up against the present service levels from FI?

FI data is perhaps the best of all domestic satellites to date largely because the computed data initially made available by RCA has been refined through an elaborate series of field tests and extensive 'modeling' by COMPUCON. Compucon feels the real-world boresight for FI and the respective boresight levels are as follows:

Antenna Set One
(Transponders 2,6,10,14,18,22)
a)Boresight approximately Ft.Dodge, Iowa
b)Maximum EIRP at boresight/ +34 dBw

Antenna Set Two
(Transponders 1,5,9,13,17,21)
a)Boresight approximately Watertown, S.D.
b)Maximum EIRP at boresight/ +35 dBw

Antenna Set Three
(Transponders 4,8,12,16,20,24)
a)Boresight approximately Watertown, S.D.
b)Maximum EIRP at boresight/ +34 dBw

Antenna Set Four
(Transponders 3,7,11,15,19,23)
a)Boresight approximately Rapid City, S.D.
b)Maximum EIRP at boresight / +35 dBw

These values are from 1 to 2 dB **lower** in the real world than RCA had previously predicted and of course this lower margin has been apparent on many marginal systems.

The data shown in Map Number One is of the same 'generation' as the earlier FI data that had most of us **expecting** 36 dBw contours over wide areas of the U.S.A. Note that the boresight is pulled slightly west and south and RCA is suggesting that with a fully peaked-out system they expect to put around 36.7 dBw into the boresight region.

Of particular note in Map One is RCA's **hope** that areas such as southern Florida will see EIRP's in the 33 to 34 dBw region; a portion of the country where present FI service suffers in the 30 to 32 dBw range. Picking up three (or even two) dB in this portion of the country is going to help many marginal systems. Another area suffering from a combination

RCA VERNON VALLEY - all three RCA satellites will be largely flown from this uplink and control center site. A similar site at South Mountain [California] completes the control network for ranging purposes.

of low look-angle (i.e. elevations close to the horizon) **plus** questionable EIRP levels has been New England. FIII promises to be slightly hotter (perhaps 0.5 dB) than most of the FI transponders in this region. The balance of the rest of us should do about the same or a tad better than with FI; **provided** the 'predicted' contours on file by RCA turn out to be the real world contours after launch and positioning of the bird. Alas, Alaska looks like it may suffer; especially in the Anchorage area west where EIRP's in the 28 dBw (and down) region will replace present levels in the 29 to 30 dBw region. On the opposite side of the service region, Puerto Rico and other islands in the western an mid-Caribbean **may find** FIII as much as 2 dB hotter than FI.

CSD would like readers to work out some local system for measuring the **relative** signal levels on each transponder for FI. Start recording these levels on a daily basis, varying the time of day each consecutive day if possible. Develop average readings (off of the receiver i.f. or some other non-AGC'd point) and then when FIII is operational (probably in February) we'll ask you to make similar transonder by transponder checks on FIII. By collecting all of the data here we should be able to develop a fairly accurate set of 'better than'/'worse than' maps in short order. In this way we'll all be able to participate in a national (or continental) effort that will establish some guidelines for the next generation of terminal builders.

FIII will also have a separate offset spot beam to provide coverage to Hawaii. RCA refers to this set of antennas as "Antenna Beams 5 and 6". They are physically offset from the main antenna reflectors, smaller in size, designed to 'squirt' some amount of signal to the Pacific Island state. The boresight EIRP for the two Hawaiian antenna patterns is 27.5 dBw and there is one vertical set and one horizontal set of antennas involved. The transponders to be squirted to Hawaii on FIII are:

1)Antenna set 5 - transponder 2,6,10,14,18,22
2)Antenna set 6 - transponders 1,5,9,13,17,21

For reference the Hawaiian FI spot beam transponders are the same as on FIII. Basic FIII operational parameters appear here separately.

THE COMSTAR CHANGE

When COMSTAR's DI bird was first launched in 1976 the bird was to be utilized only for telephone and message (data) traffic. All three of the COMSTAR birds are leased by AT&T/GT&E and are actually owned by COMSAT. These are twenty four transponder birds (alternate vertical and horizontal channelizations) not unlike the RCA SATCOM series. Physically they are larger than SATCOM and require more elaborate launch facilities. The FCC permission for the telephone giants to enter the 'domestic satellite business' was conditioned on these birds not being utilized for video (and some descrete other) purposes any earlier than 1979. The FCC at the time believed that WESTAR and SATCOM were going to have a tough-enough-time attracting users (and therefore revenue) to their domestic birds without competition from the telephone giants. So an agreement was made whereby the telephone birds could launch provided they stayed out of the domestic video business. This agreement ran out this past July and now the COMSTAR birds are 'free' to engage in the video marketplace right along with WESTAR and SATCOM.

The COMSTAR locations are spread throughout the orbit belt with DI at 128 degrees, DII at 95 degrees and DIII at 87 degrees. DIII, the most recent to launch (this past June after a mild fuss with the FCC), has been observed of late carrying a fair amount of video traffic. Other viewers report video on COMSTAR DII (95 degrees).

SATCOM FIII BASIC DATA

Satellite Owner/Operator: RCA Americom
Nominal Location: 132 degrees west
Expected Launch Date: December 07, 1979
Expected Operational Date: February 1980
Coverage Area: Continental 48 plus Hawaii, Alaska, Puerto Rico and Virgin Islands
Uplink Band: 5.925 to 6.425 GHz
Downlink Band: 3.7 to 4.2 GHz
Downlink Beacons/Data: 3,700.5, 4,199.5 MHz
Beam Pointing Stability: + /-0.26 degress
Transponder Format: 24, 12 vertical, 12 horizontal
Types of Carriers:
a)**972 channels FDM/FM in 34 MHz**
b)(FM) TV; 1 channel in 34 MHz with 2 MHz peak to peak energy dispersal
c)**1.544 Mb p/s [40 PSK] data, 1.29 MHz wide**
d)25.7 KHz FM audio, 276 channels per transponder

24 TRANSPONDER SPACE TO EARTH ASSIGNMENTS [FIII]

Center	Transponder Polarization Band	Antenna Set
3,700.5 - Beacon, telemetering downlink		
3,720	3700-3740([1] V	2 (6)
3,740	3720-3760[2] H	1(5)
3,760	3740-3780[3] V	4
3,780	3760-3800[4] H	3
3,800	3780-3820[5] V	2(6)
3,820	3800-3840[6] **H**	**1**[5]
3,840	3820-3860[7] V	4
3,860	3840-3880[8] H	3
3,880	3860-3900[9] V	2(6)
3,900	3880-3920[10]H	1(5)
3,920	3900-3940[11]V	4
3,940	3920-3960[12]**H**	3
3,960	3940-3980[13]V	2(6)
3,980	3960-4000[14]H	1(5)
4,000	3980-4020[15]V	4
4,020	4000-4040[16]H	3
4,040	4020-4060[17]V	2(6)
4,060	4040-4080[18]H	1(5)
4,080	4060-4100[19]V	4
4,100	4080-4120[20]H	3
4,120	4100-4140[21]V	2(6)
4,140	4120-4160[22]H	1(5)
4,160	4140-4180[23]V	4
4,180	4160-4200[24]H	3
4,199.5 - Beacon, telemtering downlink		

Because we are dealing with three birds and each bird has four separate downlink antennas, as you might suspect there are many antenna patterns involved. Basically all of the D series satellite data **on file at the FCC** indicates that there is a great deal of similarity between each of the three satellites. For example:

Antenna Set One
(Transponders 1,5,9,13,17,21)
a)Boresight typically in center of continental U.S.A. (called CONUS)
b)Maximum EIRP typically in the 34.5 dBw region
See COMSTAR D-I **Map Number Two** here; also COMSTAR DIII **Map Number Three** here.

Antenna Set Two
(Transponders 3,7,11,15,19,23)
a)Boresight typically on Alaska with rapid fall off on CONUS; San Francisco down 12 dB on DI for example, 9 dB on DII. On DIII the Alaskan beam is above the horizon (i.e. it does not reach Alaska because of the far-eastern location of DIII at 87 degrees).
b)Maximum EIRP typically in the 34.5 dBw region.

Antenna Set Three
(Transponders 2,6,10,14,18,22)
a)Boresight on Hawaii with a rapid fall off towards CONUS. On DI, for example, Los Angeles is down around 14 dB, on DII Los Angeles is down 10 dB and on DIII also down 10 dB. DI has a 2 dB down contour west of Hawaii as far as approximately 170 degrees (and 10 north).
b)Maximum EIRP typically in the 34.5 dBw region.

Antenna Set Four
(Transponder 4,8,12,16,20,24)
a)Boresight in Caribbean just west and south of Puerto Rico with the 2 dB down region covering virtually all of the Caribbean, Central America and along much of the coast of northern South America. See **Map Four** here for a comparison between the western most COMSTAR (DI) and the eastern most COMSTAR (DIII). Gradual fall off towards CONUS with the Gulf Coast area down 6 dB (typically) while Kansas City is down 9 dB on DI, 15 dB on DII and 17 dB on DIII.
b)Maximum EIRP typically in the 34.5 dBw region.

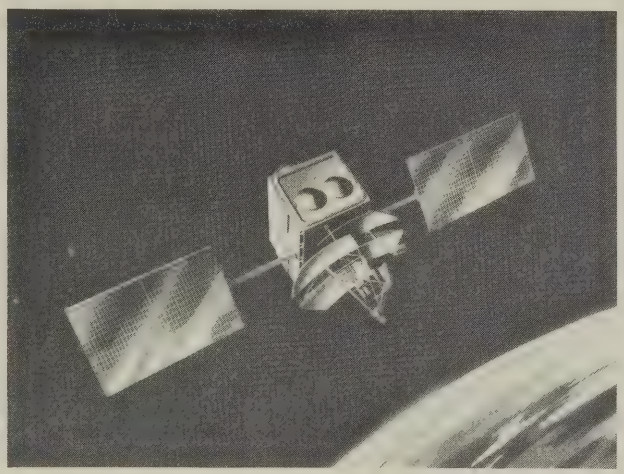
Because the COMSTAR birds are closely related to the INTELSAT system through the COMSAT ownership, and because the telephone giants have their own way of doing things, the video that is beginning to show up on COMSTAR is largely without subcarrier audio. Several observers who have found as many as six channels of video up simultaneously have yet to hear any companion audio. One observer does report

RCA SATCOM FIII - MAP NO. ONE

hearing occasional 6.8 MHz 'cue circuit audio' (instructions from the transmitting station to the appropriate receiving station) on one of the DIII video transonders but no program audio. So where is it?

In the INTELSAT scheme of things virtually all audio is transmitted via a separate transponder (from the video) using SCPC (Single Carrier Per Channel) techniques. There has been some (growing) use of 6.6/6.55 MHz as an aural subcarrier frequency in some INTELSAT circuits however and one would suspect that ultimately the somewhat inefficient technique of stripping the companion audio off at the transmit uplink station and sending it through another totally different transponder would be less and less in vogue. In the meantime if you are tuning in video from COMSTAR and cannot find audio (6.6 or 6.55) chances are you will have to go looking on one of the transponders on the same antenna set (thereby indicating the same footprint), with an SCPC receiver.

Several Caribbean area viewers report that the three U.S. commercial networks have been observed on DIII from time to time but apparently not yet on a routine or scheduled basis. COMSTAR will be 'worth watching' in the coming months as the telephone firms operating these birds get their feet wet with marketing in the video area and begin to come up with regular customers for their services. Observer reports will be welcomes for **CSD**'s 'Tuning In The Birds' portion now carried on a regular basis in the Programming Section.



COMSTAR DI - MAP NO. TWO

TECHNICAL CORRESPONDENCE AND NOTES

ANOTHER SUPPLIER?

Let me start by thanking you for the words you printed in your October CSD about my company and our 10 GHz Video Transceivers. As a result of that mention we've had several direct sales for units and several more inquiries. Also, we are currently developing 'low cost' TVRO system for consumer use. I ahve been doing a lot of research into this matter and as an OEM manufacturer I feel we can produce, in quantity, a system that will fit the average consumer's budget. We are a small company with ten employees but expanding and I'm dedicated to producing low cost amateur and commercial communications equipment such as the TVRO gear as well as the TVX10 10 GHz transceiver. I look forward to attending SPTS '80/Miami!

C. E. Green, President
TCI, Inc.
411 N. Buchanan Cr., #13
Pacheco, CA 94553

Green's firm manufactures a low cost [approximately $350] 10 GHz video [plus audio] complete transceiver ideal for short haul [up to ten miles with suitable dish antennas] baseband interconnects. Welcome to the TVRO world at TCI; we need more innovative suppliers!

ORANGE PEEL ANTENNA?

I was wondering why the old radar/Airforce trick of mounting the mixer plus i.f. at the feed of the antenna wouldn't work better than the seemingly more complex system of hanging an LNA out there and then piping that hard to

COMSTAR DIII - MAP NO. THREE

replicate 4 GHz energy down expensive coax? Also does anyone happen to know where I might locate 'height finder' Orange Peel antenna such as it used in the 2 GHz range? I've got the feeling that one of those would make a good start on an antenna system here.

Robert A. Collings
Box 434
Stettler, Alberta
TOC 2LO Canada

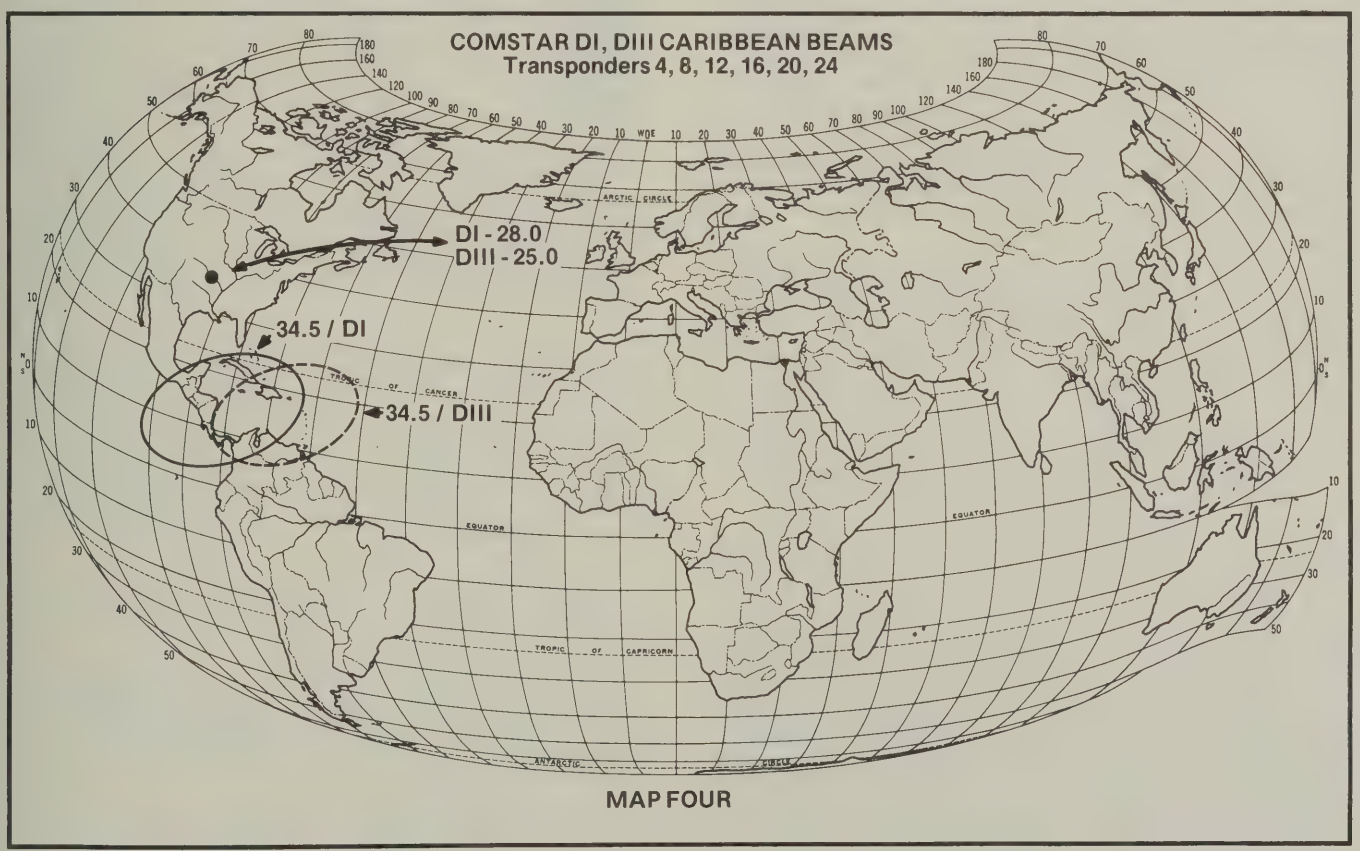
There is nothing wrong with converting to the 70 MHz i.f. at the antenna; nor with converting to a high i.f. such as 1,200 MHz [for a double conversion receiver] there was well. Robert Coleman's low-cost approach does just that. However, as Tay Howard points out the more electronics you have at the feedhorn the greater your 'opportunity' to climb a ladder and repair or replace something, or tweek, during poor weather. Bob Coleman has also learned that the Avantek VTO 8360 VCO source, mounted outside at the feed in a container, is somewhat less stable when there are wide temperature extremes than it was this past summer when the weather hovered in the 70-90 degree range. Coleman's working on a solution to this but anyone expecting to simply hang it in a box at the feed and remotely tune the system with the 8360 tuning voltage should be prepared to do some tweeking as the weather changes and it gets cooler. We can picture the 'Orange Peel' antenna in our mind and in a sense it is a one-dimension Spherical. Whether it would have sufficient gain at 4 GHz is another matter. Anything less than around 40 dBi is marginal.

A COMPLETE KIT?

I would like to know if I can buy a completed kit to receive the signals from the satellites? I intend to use a Jim Vines 16 foot parabolic and would like to acquire a receiver like that shown on the inside front cover of the Howard Terminal Manual.

Joe Cotic
Cassiar, B.C.
Canada

A complete kit is called a factory assembled unit. The closest thing to the Howard Terminal receiver in the commercial [off the shelf, ready to plug in and turn on] field is the International Crystal Mfg. Company [ICM for short] TV-4200. This receiver has a list price of $1995 and it follows closely the Howard Terminal [do it yourself] receiver design. The 4 GHz to 70 MHz portions [converts to 1200 MHz region for high i.f. and then to 70 MHz for low i.f.] is ala Paul Shuch's Microcomm modules. The 70 MHz i.f. to baseband portion is straight Taylor Howard. To our knowledge, this is the least



MAP FOUR

expensive receiver [built and aligned] on the market today. ICM's addres is 10 N. Lee, Oklahoma City, OK 73102. Now as for kits...bit by bit, they are coming along. Robert Coleman's 4 GHz LNA is not yet kitted but you can buy the boards and the chips from him. Same applies for his active GaAs-FET mixer and VTO 8360 LO source. That gets you down to 70 MHz. We expect in either February or March issue to tell you about a complete 70 MHz i.f. strip [amp] and a 70 MHz to baseband demodulator system that will be available as a kit. It IS getting easier all of the time!

WHAT ABOUT CONNECTICUT?

Will a ten foot dish give a high quality picture in Connecticut? A number of people tell me yes; others say positively no. If the answer is no, what is the minimum size that will give a good picture here? Is there any truth to the rumor that RCA's new SATCOM FIII will place an even lower signal level into New England than FI now does?

Melvyn Shank
Master Antenna Systems, Inc.
Orange, CT 06477

If you are considering FI or FIII reception, a ten foot dish in any **portion of new England would be marginal. The problem is not signal level; as much as it is the low look angle** (i.e. the satellite is down close to your horizon; Boston is 9 degrees to FI where it is now and will lose more than another degree when FI relocates to 136 degrees west). **Low look angles are 'noisey' because the earth terrestrial noise** (which is a 290 degree K noise source at best) **begins to show up on the antenna sidelobes** (unless you are very clever and careful with controlling side lobes on the feed antenna). **The minimum size recommended for New England is a 12 foot antenna** (parabolic) **although a ten foot Swan Spherical might play if you worked carefully with the tilt angle. What will the FIII signal levels be from their pre-supposed 132 degree west location? Good question. RCA wants to try to 'pull' the boresight down so that the marginal levels in Florida and the Southeast come up a tad. If they pull it up there, it is bound to go down somewhere else and New England is as good a candidate as anyplace. The real truth is that AFTER FIII is on station, then and only then will be know what we've got.**

INDOOR TVRO?

I am interested in building a low-cost satellite TV receiving system. Can an antenna of 8 to 10 foot diameter work inside of the room where I live? I live on the first floor of a two story rooming house with a big window facing to the west and another to the north. In this city there are a large number of casinos a few blocks away.Will their FM VHF transmissions which they use for security purposesinterfere with my satellite TV reception? How much skill for assembling the unit in your plans can be acquired 'on the job'. I do have experience working in electronic assembly and I can read blueprints.

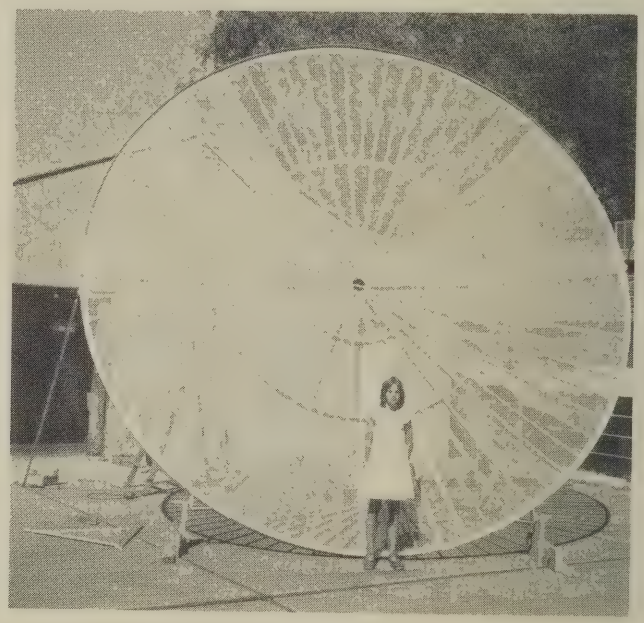
Paul Lansdale
Reno NV 89501

Inside is out. Even if you were fortunate enough to have a 'big window' [large enough for the full 8 to 10 foot parabolic to look through without occulsion] facing towards the satellites [you don't as it is southwest of you], 4 GHz energy does not like glass windowpanes. The loss is not great [around a dB or so] but probably more than you can stand. Local signals should not be any type of problem provided the receiver is built in a good RF-tight enclosure. Remember that in the Howard Terminal receiver the PLL operates at 70 MHz itself and with good construction practices you manage to keep the several volt PLL 70 MHz signal out of your channel 4 re-modulated RF output. So a puny local signal should not be a problem. Yes, we think anyone who is half talented can build the Howard Terminal. Coleman's approach requires more background in electronics, assuming you are willing to tackle Robert's designs. If you decide to move to a rooming house with a large southwestern exposure we'd love to have a photo of your ten foot dish mounted inside your home. Now THAT would be a conversation piece [psst young lady...would you like to come up to my room to see my ten foot...dish?).

OLIVER S. REVISITED

Enclosed are some photos of the Swan five meter Spherical antennas now being manufactured in California. Gardiner Communications sent a man here from DALSAT to check the antennas operation parameters. He said that the overall gain was just slightly less than a parabolic of the same size. We made a polar plot and found there were no sidelobes detectable above -30 dB. The cross-pole characteristics were better than FCC requirements.

Oliver Swan
Swan Antenna Systems
200 Swan Rd., RR #1
Bisbee, Arizona 85603



That's Oliver's daughter Penny with the five meter production-model Spherical. The whole antenna weighs a mere 375 pounds. Yes, we know it looks round (as in parabolic) **but we** assure you **this is a true Swan-Spherical! The round shape is for a combination of practical reasons including noise temperature performance. Oliver recently underwent surgery and is confined to home for plenty of rest. We think he'd appreciate hearing from his many friends and admirers even if only a** 'Get Well Soon' **card.**

PUBLISH IT

If you are looking for feedback on material that readers would like to see covered here in CSD, my suggestions follow:

1)How to get 'legal' with a TVRO.
2)How to become a 'cable TV system' and register with the FCC even though you have fewer than 50 subscribers (this way your TVRO can be registered and you can be legal with the program suppliers).
3)Where to get component parts such as the chip capacitors.

Bernard Dunn

We are always looking for suggestions on materials to publish. Getting 'legal' is now a cinch. Just build it, and when the FCC finally figures out what they want from you in the form of a registration form, send it to them. And get permission [or contracts] from the program suppliers as well. We will cover in detail how to set up a small, under 50 subscriber, CATV system [so you can re-coup some of your TVRO investment by hooking

up homes in the area for a fee] in our February CSD. It is a good idea who's time has come. Every issue has lots of component parts sources. Anyone who is having trouble finding parts, still, should drop a a line. We'll try to help. If you want a direct answer to ANY question, enclose a stamped, self addressed envelope to speed things up here.

DATA, DATA, DATA

Have been following with interest the first three parts of your series in RADIO ELECTRONICS. How does one go about finding the specific frequencies of individual companies, TV network feeds, etc? I am interested in the remote STL as well as the satellite frequencies. Are there not a great many other satellite frequencies other than the 3.7 to 4.2 GHz band? Can these other satellites be picked up with some modifications to the basic 4 GHz receiving equipment? I am also quite interested in being able to receive terrestrial microwave hops.

Ronald A. Levinson
St. Louis, MO 63132

Yes, there are several other active satellite bands. However, none at the moment [other than the 11/12 GHz downlink band] have video or public audio on them. We will be starting to feature a 11/12 GHz receiving system for INTELSAT and where applicable [such as in Canada] the new Ku band transmissions very shortly. English system designer Steve Birkill, who starts with us this month as a regular feature writer, has promised to share the construction details of his 11/12 GHz satellite receiving system. During the next year as the INTELSAY V birds become operational, there will be plenty of 11/12 GHz video available. Reception from other satellite services (largely operated by the military) **is kind of out of our bag. And the same applies to reception of the terrestrial STL and other private hops in operation; at least for now.**

NOISE TEMP AND 'DETECTORS'

I have been reading the series in RADIO ELECTRONICS and have a few questions. In Table 1, page 85 for R-E October you indicate the noise temperature of the amplifier used in the preamplifier portion of the system. Clearly a larger antenna means more signal going to the 'detector' meaning that with a larger antenna, you can get by with a larger noise figure as well. The chart indicates this to be true. However the chart indicates for the smaller sized dishes that the LNA must be in the 100 to 200 degree K range which is actually lower than room (earth) temperature. Is this possible without going to liquid nitrogen cooling?

I assume the parabolic dish acts as a reflector and the dish shape is independent of frequency. It seems to me that the dish is the most complicated (and therefore expensive) part of the system. It is not clear to me why this technique is used. It seems to me you could build a flat 'detector', of the same aperture as the dish, and achieve the same results without the complications of achieving a parabolic curve. Could you not create a flat reflector surface and suspend driven elements in front of the reflector surface such as I have drawn here?

Brent Bardly

There is considerable confusion from those just entering this field about both the noise temperature of a system and the reason for the parabolic antenna. True, room or earth temperature is approximately 290 degrees K. That says that if you could 'load' or connect the feedline of your receiver directly to the earth, you would find [and be able to measure] a permanent noise temperature of around 290 degrees K. This is part of the reason why smaller dish antennas that must achieve a low look angle [i.e. they point at the satellite with an antenna elevation down close to the earth] are in trouble; the noise temperature of the earth, picked up by the side or minor lobes of the antenna, creates a 'noise floor' in the 290 degree K region and it is impossible [given the earth noise contribution] to create a system noise temperature that is appreciably lower than the earth's noise temperature. When your location plus the satellite you desire equals something less than 8 to 10 degrees in antenna elevation, the earth begins to contribute noise through the side lobes of the antenna. Larger aperture antennas have lower [less sensitive] side lobes and they therefore are necessary when the look angle gets low. The same thing is true with trees and other objects in front of the antenna, in line with the antenna's boresight heading to the satellite. Not only will trees absorb 4 GHz energy but they are a noise source at 4 GHz as well. The combination of extra loss from the absorbing trees [buildings, etc] plus the noise contribution from these 'blockages' creates a situation where you simply lose the 4 GHz satellite signal into the noise.

Sky noise, on the other hand, is in the under 25 degree K or so region. Because it is lower than the noise temperature you are creating with your LNA, it is not a problem. Present low noise amplifiers are able to achieve a unit noise temperature in the 100 degree K region withOUT cooling although liquid nitrogen [etc.] cooling techniques are utilized in large INTELSAT systems [utilizing cooled Parametric design amplifiers in the $50,000 per device range] where antenna system noise temperatures down in the 25 degree K noise region are required. If you took one of these INTELSAT installations with a 25 degree K system noise temperature and cranked the antenna around where it looked into the earth [say a nearby hill] the system noise temperature would then become approximately 290 degree K; simply because the earth's noise was the new 'noise floor' of the system.

The antenna configuration you suggest seems mechanically simple but electrically it is a bad choice. You are suggesting that driven [or dipole] antenna elements be stacked or phased together in some fashion. This involves coupling one to another, in a format that allows the signal picked up by one dipole element to be added to the signal picked up by the other dipole elements. At GHz the phasing or [to use a VHF phrase] 'stacking' lines or networks are at best lowsy. As you stack or phase driven elements you find that the phasing line sections

SATELLITE TV EXPERIMENTERS
INTRODUCING A COMPLETE
3.7 — 4.2 GHz DOWNCONVERTER
- 3.7-4.2 GHz in, 70 MHz out
- Remote, one control tuning
- Dual conversion - stable
- Assembled & tested. Only $895.

Polar Mount and Remote Feed Rotation Plans For Your Dish.
SUPER! $10.00 postpaid

EXPERIMENTERS SUPPLIES
- Teflon PC Board, dielectric constant 2.55
  1/16''x9''x3'' (approx.) $14.00
  1/32''x9''x4'' (approx.) $14.00
- Chip capacitor kit, 4 each of total 18, 27, 39, 220, 4700 pf... only $18.00
- SMA and microwave connectors, inquire
- 2''x14'' copper tube for Birkhill feed, 3 lbs. $12.00

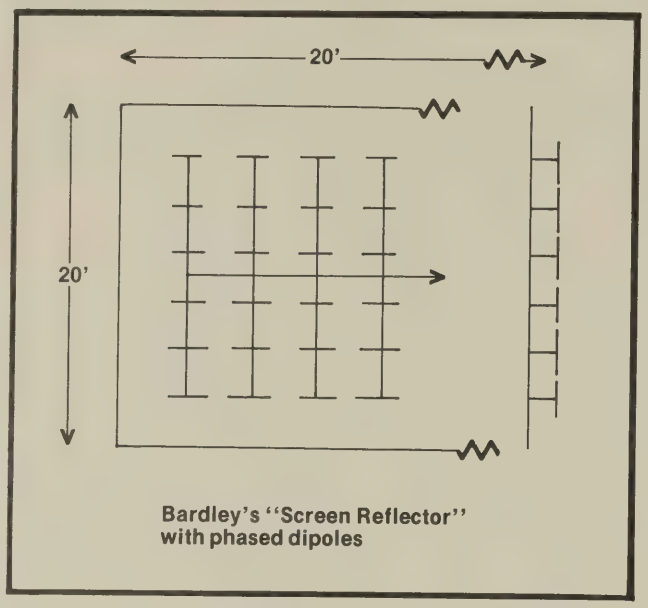
WRITE - We are adding to our inventory!

SATELLITE INNOVATIONS
P. O. Box 5673
Winston Salem, N.C. 27103

Add $2.00 shipping and handling (except for plans)

THIS PRODUCT NO LONGER AVAILABLE

actually lose signal faster than you gain it by adding the dipoles together. The designer is also presented with monstrous impedance matching problems. It is not impossible to make work [large phased arrays are common in radar systems in this frequency range] but it is far more expensive to tool for and build than the relatively simple parabolic curve that depends upon only a single 'dipole' [or monopole] 'detector' element mounted at the focus of the array.



Bardley's "Screen Reflector" with phased dipoles

UNIVERSAL PARAFRAME MOUNT

Paraframe, Inc. (P. O. Box 423 / 1000 Sunset Drive West, Monee, IL 60449) antennas are now being equipped with a universal mounting plate for LNAs. This plate allows virtually unlimited interchangeability of LNAs since it can be adjusted for a wide range of offset LNA dimentions. The plate can be drilled to accept any LNA boltdown pattern and is now standard on all Paraframe TVRO antennas. Full details from Jim Vines at Paraframe.

GREAT OPPORTUNITY

I understand you were instrumental in organizing an international confereance dealing with the practical technology in the satellite terminal field. I would be very interested to receive information on equipment and firms in this field as I am interested in pursuing opportunities available in marketing complete systems in the Province of Saskatchewan. Ours is one of the wealthiest provinces in Canada and we are presently developing our abundant resources in mining and petroleum. The area is large but the popular per square mile very small. Most people live in small, remote communities or on large farms. The existing television service is very poor, the majority of the areas having only one or two channels of service. With the changing lifestyles that are sure to follow high energy and transportation costs, home entertainment will be forced to take on new meaning and priorities. I believe the market prospects for home satellite systems and I want to explore this potential.

John W. Shivak
Professional Engineer
Prince Albert, Sask.

Many people share your intuition about the coming importance of self contained living centers. With fuel costs soaring frequent trips to town for rural folks may well become occasional trips to town. More and more of what it takes to make life sustaining will have to center within the home and that does suggest that satellite television terminals may well become the 'travel vehicles' fo the 80's and beyond. The future...is here, now.

THE COMPONENTS SCENE

MORE PM-200

The RCA XL-100 module discussed in the October CSD is apparently destined to become a very popular method of extracting the desired FM sub-carrier audio from the TVRO receiver. Lindsey Riddle of New Orleans reports he found the unit available at several outlets under stock number 130-753 with a price tag of about $12.00. Several others report that there is a companion XL-100 module that mates with the PM-200 to give you 7 watts (that's the claim) of audio output. The audio module takes audio drive from the PM-200 through an interconnecting cable and the pair of units plus a coupling capacitor and a volume control puts you into the audio business for very few dollars. The PM-200 is apparently available in two different ways; either as a brand new replacement module (in the $12 price range) or as a re-built device in the $6 to $7 region.

CHARLIE'S VIDEO DISTRIBUTION AMP

One of the problems anyone runs into once he has his TVRO operating is how to insure that you have a sufficient number of video outputs that are (1) properly isolated from each other, and (2) properly 'leveled' to give you sufficient baseband product to drive modulators, monitors, test gear and the like. A video distribution amplifier is one possible; but video distribution amps are often complicated, and over designed by people who are after different performance than you.

The circuit shown in the November CSD came from Charles Kennamer of South Oklahoma City Junior College. Some of you who attended SPTS '79 this past August may recall Charles and his staff; they provided the first rate video production equipment and personnel to immortalize the event.

You have a 75 ohm video (baseband) input driving a garden variety 733. Perhaps other devices would also do the job (the 733 is still fairly expensive). This in turn drives a quad of RCA 40317 (many other substitutes available) devices. Each 40317 provides an isolated baseband output; 75 ohms. Voltage gain through the system is around 6 dB or so which means you can create four isolated outputs from the single output at about the same level as you came in. That should give you plenty of signal to loop video all through your installation to drive as many video operated (baseband) devices as you can dream up.

Our thanks to Charles Kennamer for sharing this most useful circuit.

Chip Source

Microwave system builders may be interested in a source of chip capacitors which for the occasional builder looks like a pretty fair deal. In fact, several enthusiasts could get together and 'chip in' on the package available and all come out with the required capacitors for a number of the projects we discuss here in CSD.

VITRAMON (P. O. Box 544, Bridgeport, CT 06601) has a 'sample kit' of chip capacitors (kit 101) which has been running on special for $59.95 (normal $99.95). The kit has 240 chips of various values in it and according to those who have ordered the kit "virtually all of the values are useful in TVRO work".

GaAs-FET Source

A new source of GaAs-FET transistors is **MELCO SALES, INC.** (3030 E. Victoria St., Compton, CA 90221). Their model MGF 1402 has a spec sheet noise figure of 1.1 dB at 4 GHz (3.0 dB at 12 GHz) with associated gain of 13 dB at 4 GHz and 8 dB at 12 GHz. MELCO has supplied some samples to several innovative builders such as Robert Coleman and chances are their performance will be discussed here in the coming months.

Missing Coupling Cap

The October issue of CSD contained a circuit for Robert Coleman's active GaAs-FET mixer. The schematic on page T7 should be modified so that the '4 GHz input' terminal couples through a .001 chip capacitor. The schematic shows the 4 GHz coupled directly from the coaxial connector to the input strip line.

The same schematic shows the operating voltage for the VTO 8360 as +24 VDC; this should be +15 VDC, as the alternate schematic at the top of the page notes. The VTO 8360 will function on +24 VDC but his is at the high end of its rated operating voltage range and Coleman has found the +15 VDC supply is better for the unit's stability.

Building Material Sources

If you are having difficulty locating some of the common-to-microwave but not stocked at the local radio emporium parts to construct your own 4 GHz receiving terminal, reader Steve Birkill supplies the following list of U.S. sources for the categories shown. Many of the firms have sales outlets scattered across the country and a call or letter to their offices given here may turn up such an outlet close to you. If not, you can deal with them directly.

PTFE-Glass Laminate Circuit Board

This is the circuit board which you must use in all microwave circuit areas. Board nomenclatures vary from company to company; explain what frequency range you are working in (4 GHz) and always order double sided board.

Keene Corp., Chase-Foster Div., 199 Amaral St. E, Providence, R.I. 02914 (401/434-2340)
Rogers Corp., Micromat Div., P.O. Box 700, Chandler, AZ 85224 (602/963-4584)
3M Company, Electronic Prods. Dept., 3M Center 223-4, St. Paul, MN 55101 (612/733-3350)
Oak Inds., Atlantic Laminates, 174 N. Main St., Franklin, NH 03235 (603/934-5736)

SMA Coaxial Connectors

These are the tiny connectors highly recommended for 3.7 GHz and above, especially for intra and inter-stage connections.

Sealectro Corp., 225 Hoty St., Mamaroneck, N.Y. 10543 (203/258;6261)
OmniSpectra Inc., Mico Conn. Div., 140 Fourth Av., Waltham, MA 02154 (617/890-4750)
Connecting Devices, Inc., 125 Lomita St., El Segundo, CA 90245 (213/322-6885)

CHIP Capacitors

In addition to sources given in previous issues, and including some of those sources, here are places to locate hard to find chip capacitors.

Vicramon North America, P. O. Box 544, Bridgeport, CT 06601 (203/268-6261)
Johanson Dielectric Inc., Box 6456, Burbank, CA 91505 (213/848-4465)
JFD Elec. Components Corp., 15th Av. at 62nd St., Brooklyn, NY 11219 (212/331-1000)
Dielectric Labs Inc., 64 Clinton Rd., Fairfield, N.J. 07008 (201/575-8922)
ATC Inc., 1 Norden Ln., Huntington Station, NY 11746

Readers with updates, alternate parts sources should report same to CSD for future updates of this listing.

REAL WORLD TECHNOLOGY MATERIALS

Steve Birkill makes some of his circuit boards and past writings available on a **direct** basis to readers of CSD. All prices are in pounds Sterling which simply means that you must go to your bank and obtain a check/Sterling order in the proper exchange amount (as computed at the time the check is drawn).

2 Stage LNA Circuit Board - As originally described in CATJ for July 1979 and subsequently described in early versions of the Coleman TD-2 Conversion Manual. Board is Chase-Foster Di-Clad 1/32 inch PTFE-glass laminate, etched with the 2 stage LNA circuit but undrilled. Price is 20 pounds per board.

Consultancy Service - Brikill's unique background and knowledge in the satellite world equips him to find hard answers to hard problems whether North American oriented or world-wide in scope. Consulting by letter only, state your questions and objectives clearly. Response by airmail; price is 10 pounds per letter.

CATJ Birkill Articles - Articles written by Birkill appearing in CATJ magazine are difficult to locate. Copies through CATJ are no longer available. Copies directly from Birkill are available at 2.5 pounds per article. Titles available are:

10/78 - **Introduction**, background, Birkill terminal, phase-lock demodulator.
11/78 - **Down-link equation**, G/T evaluation, az/el angle graphs
12/78 - **Bandwidth requirements**, pre-emphasis, Atlantic satellites (INTELSAT)
1/79 - **Energy dispersal**, Pacific and USSR satellites, transponder frequencies
2/79 - **Practical Multipole feed**, leased INTELSAT TV channels (Spain, Sudan, etc.)
3/79 - **Outline** of experimental receiver, downconverter (remote)
4/79 - **Orbital congestion**, Ku-band systems, BSE, CTS, OTS
5/79 - **Ku-band** receiving techniques, comparison 12/4 GHz systems
7/79 - **Detailed design** for 300 degree K bipolar LNA, 4 GHz
9/79 - **System calibration** utilizing ground noise/stellar noise.
10/79 - **System calibration** using solar noise / stellar noise.

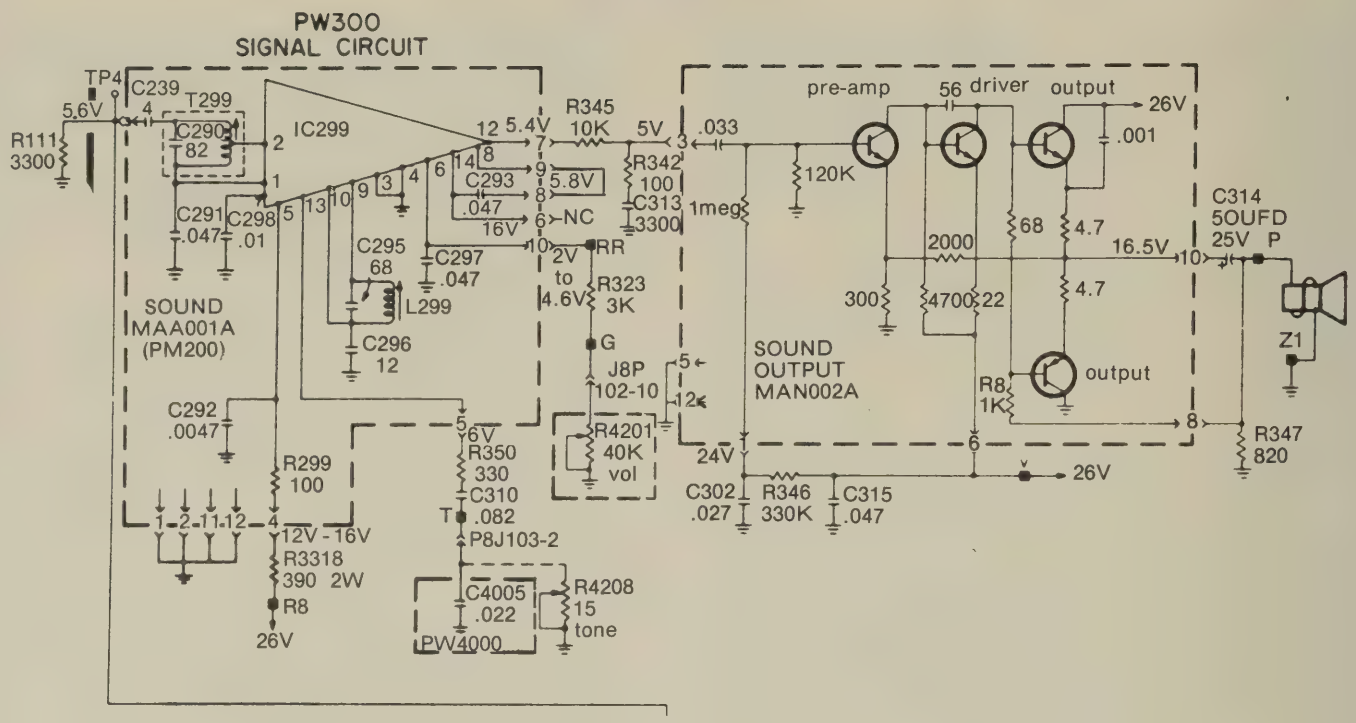
To order any of these Birkill materials, you may write: **Mr. S. J. Birkill, Real-World Technology, 128 Cross House Road, Grenoside, Sheffield, S30 3RX, England.**

REVISITING PM-200

CSD reader and satellite enthusiast Steve Gibson of Los Angeles provides some additional data on the October **CSD** described circuit utilizing the RCA PM-200 subcarrier audio module. Steve's information is so thorough that we are providing readers with an expanded schematic of the system.

Steve reports the RCA replacement number is MAA001A. The cost for the module, in Southern California, was $14.30 per module plus a $3.00 charge for not turning in a 'dud'. Total cost then just over $17.00. As Steve notes ''a moments reflection at the layout will reveal that the IC is the popular LM3065 (CA3065, MC1358) and is indeed the substance of Tay Howard's sound section design! ''.

Steve goes on to note that while 33 pF was suggested as a substitute for C290 and C295 he found that by placing 47 pF for C290 and 25 pF for C295 this allowed him to **tune** the full subcarrier band from 5.5 to 8 MHz with ease. He also notes that you must remove the T299 can to change C290 and having done so must **replace the can** on T299 or the circuit will not function (i.e. the can has importance!). He also notes that the circuit published in the October CSD does not make use of the electronic attenuator built into the LM3065 although his



modification as shown here does and with fewer overall parts.

Exact tune-up details on this module and the companion audio power amplifier have been published in TAB BOOKS #662; "Servicing The New Modular TV Receivers, Volume 1" by Stan Prentiss. He also suggests seeing pages 29, 35, 47, 51, 57, 59 and 79 of the 'Sams Photofact' on the (RCA) CTC-48 chassis for the same details.

"**Alignment is a piece of cake. All you do is feed your RF generator into pin 3** (pins are numbered left to right on the trace side but 1 and 2 are combined as are 11 and 12) **and hang a wideband scope on pin 9 of the IC. Set the generator to the desired frequency** (mostly 6.8 MHz on SATCOM and 6.2 MHz on WESTAR) **and then tune T2 and L2 for maximum. Last, back the generator down below limiting and peak again. You may still need to tweek on L2 to finally clean up the audio in an actual reception situation.**"

Steve continues "I did a little research and learned that R299 can be 220 ohms on some modules though it doesn't seem to matter in as much as the unit worked fine on both 12 or 16 volts. The supply must be well filtered. Just like Tay's circuit, I used 50K for the volume control and minimum resistance was maximum volume. (However), I found the sound quality to be rather 'bright' without the tone control parts option."

Hat's off to satellite enthusiast Steve Gibson for taking a **CSD** circuit and making it better and easier for the rest of us to understand. Will this be the final segment on the ubiquious PM-200 module? We doubt it!

HOWARD TERMINAL UPDATE

ADDITIONAL IMPROVEMENTS

Of all the circuits and systems in operation in private satellite TV land, the Howard Terminal system is perhaps the most widely duplicated and its practioners reportedly are very happy satellite-video-nuts.

Well over 1,500 of the Howard Terminal Manuals have been distributed to date and there is every indication that by the end of SPTS '80 in Miami that number will double. This means a lot of people have directly acquired this manual from STT and who knows how many 'bootleg' copies exist on top of this 'original copy' quantity!

In the October **CSD** we reported on some editorial improvements which were to be added to those manuals already in place; and to those terminals already in operation or under construction. System designer Tay Howard now provides some additional modifications including a newly designed marriage of the video demod system and the video stages. The schematic for the 'marriage' appears here. Note that this revised, updated circuit replaces **both of the circuits** appearing on pages 19 and 23 of the Howard Terminal Manual.

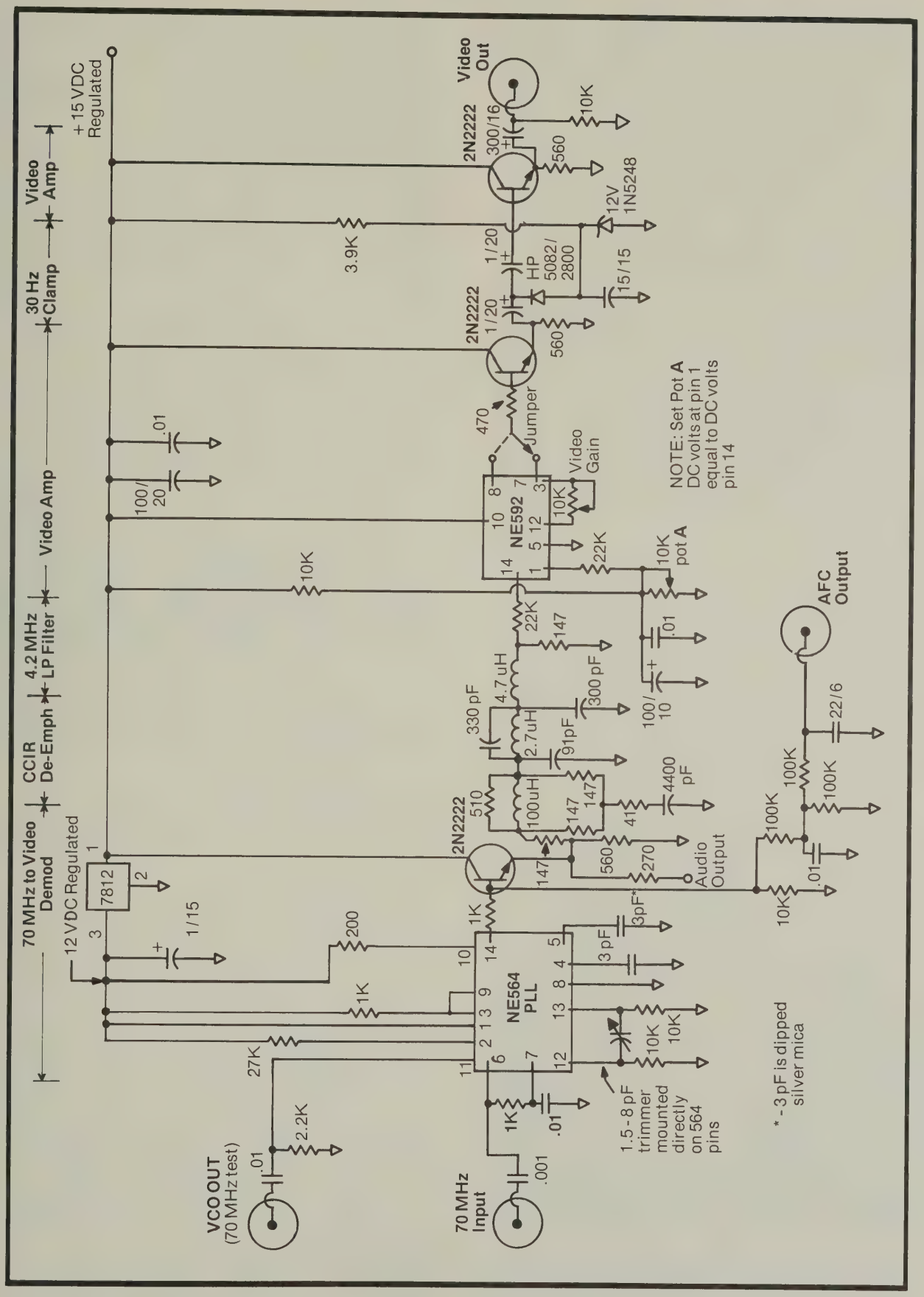
Does this suggest that the circuits on pages 19 and 23 do not work properly? No, not at all. This modified circuit is simply 'better'.

Other Changes

For those with existing hardware based upon the Howard Terminal Manual, here are some improvements that will capture the essence of the revised video demod and video amplifier shown in combination here:

Video demod card / page 19:

1) **Remove** the 4.7K resistor from pin 14 of the NE592 going to the 5.6K resistor;
2) **Eliminate** the 100/10 in series between pin 14 of the NE564 and pin 14 of the NE592 (also a 22K resistor here). **Replace** this removed capacitor **with a jumper.**


70 MHz to Video Demod
CCIR De-Emph
4.2 MHz LP Filter
Video Amp
30 Hz Clamp
Video Amp
+15 VDC Regulated
12 VDC Regulated
7812
1/15
200
1K
27K
2.2K
.01
VCO OUT (70 MHz test)
NE564 PLL
1K
.001
70 MHz Input
3 pF
3pF*
10K
1.5-8 pF trimmer mounted directly on 564 pins
* - 3 pF is dipped silver mica
2N2222
510
100uH
147
41
4400 pF
560
270
Audio Output
330 pF
4.7 uH
2.7uH
91pF
300 pF
22K
147
10K
pot A
NOTE: Set Pot A DC volts at pin 1 equal to DC volts pin 14
NE592
Video Gain
10K
22K
100/20
.01
470
Jumper
2N2222
1/20
560
HP 5082/2800
15/15
3.9K
12V 1N5248
2N2222
300/16
560
10K
Video Out
100K
100K
100K
.01
10K
AFC Output
22/6
100/10

3) **Replace** the 5.6K resistor in series with the 4.7K (pin 1) to ground on the NE592 with a 10K pot. Adjust this pot so that the DC voltage appearing on pins 1 and 14 of the NE592 is equal on both pins (using pin 14 as the reference).

Audio card/page 24:

1) The lead from pin 5 of the CA3065 to the +12 VDC buss should have a (new) 10 ohm resistor (**between** pin 5 and the 12 VDC buss).

Tay Howard and Robert Coleman are working together on a single board to include the combined circuit shown here. When completed the board will be available from Coleman; we'll keep you advised.

THE WORLD ABOVE 10 GHz

by
Robert M. Richardson
Richcraft Engineering Ltd.
Drawer 1065
Chautauqua, N.Y. 14722
[716]753-2654

Hello there. I met many of you at CCOS '78 in Oklahoma last year. For those of you whom I did not have the pleasure of meeting, let me introduce myself. My name is Bob Richardson, W4UCH/2. Coop and I are old friends from as far back as 3 sunspot cycle peaks ago when we used to work each other daily on the 6 meter VHF band, via F2 propagation from Virginia to California. The last 2 years my vocation has been designing and testing a number of interesting projects utilizing the Microwave Associates' Gunnplexer (tm) 10 GHz transceiver module, with the end objective of writing a 300 page Cookbook on the subject. The book was finally completed during summer '79 and is being published around Christmas '79 by the Ham Radio Publishing Group in Greenville, NH.

GUNNPLEXER COOKBOOK/A FEW SURPRISES:

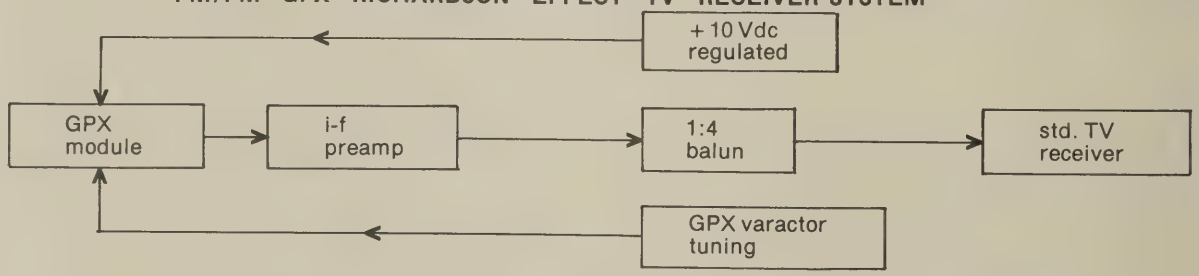
The GPX Cookbook is aimed at the newcomer to microwave techniques including: radio amateurs, E.E. students, and most anyone interested in gaining a solid foundation in the subject. Its 16 chapters cover theory quite modestly and are primarily devoted to building low cost systems that include:

- -frequency measurement (Sears Roebuck micromemeter)
- -relative power measurement (Poly Paks diodes)
- -power supplies and system control modules
- -proportional temperature control
- -low noise i.f. preamplifiers
- -weatherproof enclosures and mounts
- -automatic frequency control circuits
- -wideband fm communication systems
- -10 GHz crystal-controlled weak signal sources
- -parabolic reflector design & construction
- -crystal-controlled phase lock system (Chautauqua effect)
- -narrowband fm afc communication systems (3 kHz deviation)
- -narrowband fm crystal-controlled systems (840 cycles dev.)
- -television and computer video data links
- -epilogue (this is the big surprise)

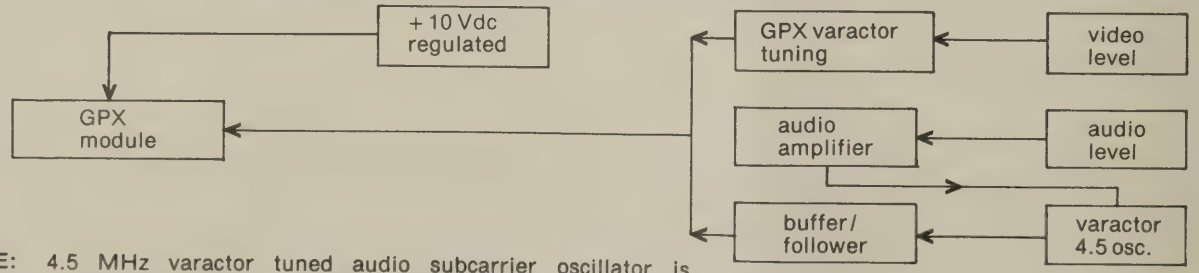
Most of the material is straight forward and well known to any practicing microwave engineer, but through sheer serendipity two rather surprising discoveries were made that to the best of our knowledge have never been reported in the literature.

1) The first discovery was that by introducing a crystal-controlled harmonic at "the 10 GHz i.f." of a Gunnplexer, with appropriate amplification and feedback to its varactor, the am and fm spectral noise (this is

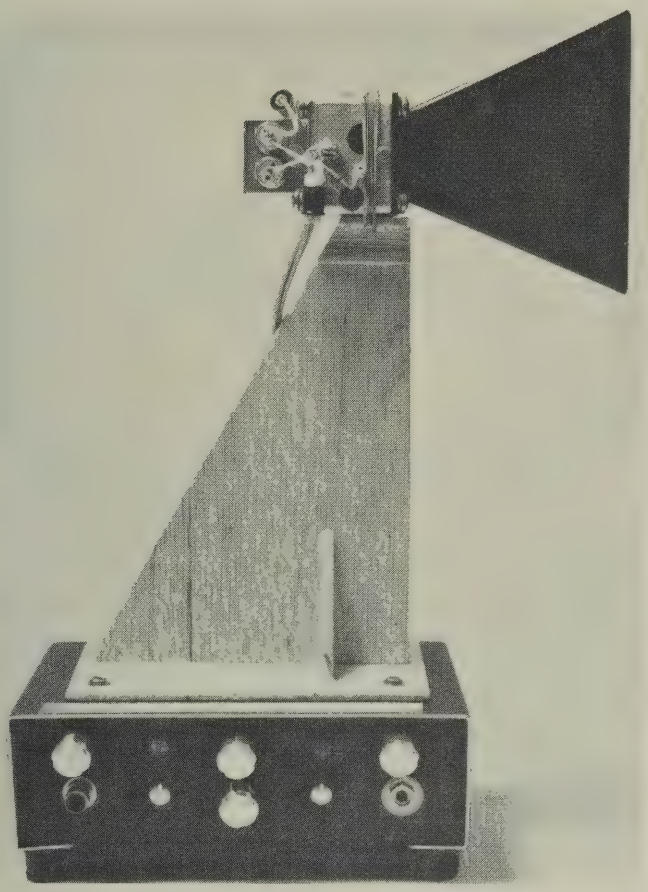
FM/FM GPX RICHARDSON EFFECT TV RECEIVER SYSTEM



FM/FM GPX RICHARDSON EFFECT TV TRANSMITTER



NOTE: 4.5 MHz varactor tuned audio subcarrier oscillator is "fine-tuned" on frequency with 500 ohm pot. This same varactor also serves to FM the oscillator whose deviation is adjusted by the audio level control.



BARE BONES 'Richardson Effect' FM/FM receiver; apply 10 VDC to Gunn diode, coarse and fine varactor tuning produces VHF channels 2-13 i.f. output directly to television receiver.

the noise generated by the mechanism with which the Gunn diode oscillates) virtually disappears thus allowing very narrowband communication; i.e., such as 850 cycle frequency shift keying using Morse, Baudot, or ASCII code.

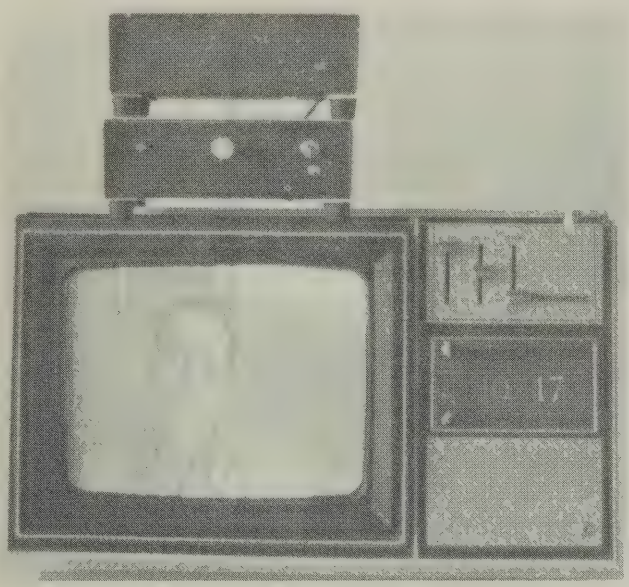
There is nothing "new" about phase-locking a Gunn oscillator to a reltively **pure** (spectral noise) harmonic of a crystal oscillator at the Gunn diode frequency. What is new is being able to do it at the i.f. with only a simple $39 ham radio 3/4 meter power source using a cheapy diode to generate the 23rd harmonic at the 10 GHz (i.f.) frequency and feeding it into the Gunnplexer about 2 feet away from the GPX module without butchering up the module itself. We called this discovery the "Chautauqua effect," for the locale where it was first discovered and reduced to practice. It has no impact or effect on wideband fm operations such as TV or computer video data links which would be of interest to you, so let us skip past it for now.

2) The second discovery will be of interest to you as it concerns a grossly simple means of implementing a 10 GHz TV data link, point to point relay, and/or TV distribution system that can supplement/complement cable systems. Most engineers will not believe it **until** they see it (which is understandable) as it violates many of the principles they have been taught since GO. It is nothing more than using a simple 10 GHz Gunnplexer with FM video carrier and FM audio subcarrier to relay a complete TV channel from one point to another where it is received by another Gunnplexer (with i.f. preamp) **and fed directly into a standard American NTSC television receiver with no FM to AM conversion of the video signal whatsoever.** It sounds impossible, but video and audio is **studio quality.**

RICHARDSON and his pair of W4UCH 10 GHz Gunnplexer systems.

SUPER SHOCKSVILLE

This discovery was made on April 3, 1979 and tested on 6 different varieties of ordinary commercial black & white TV receivers (we have not yet discovered color though it will work with color as well as black & white), since we too did not at first believe it possible to run raw FM video with audio into a standard TV receiver and see anything but garbage and the like. Studio quality video from **pure** FM? Who are you kidding?



5.5 MILE PATH across Lake Chautauqua at 10 GHz utilizing a pair of Gunnplexers with 25 inch 'Snowsled' [$7.00 each!] parabolic reflectors.

All the textbooks, literature, commercial microwave video relay systems do indeed transmit FM video, but it is **then demodulated** to a baseband video signal which is used to **amplitude modulate** a carrier on the proper TV channel and the lower sideband filtered out (vestigial sideband) before being put on cable and/or input to a TV receiver.

Still not believing what we were seeing with FM video, we ran the following tests before even making a notarized patent disclosure:

-Was it only **slope detection** on a single misaligned TV set?
-No it was not. As mentioned previously it worked on: RCA, Admiral, Philco, Zenith, Sanyo and Panasonic TV receivers with video and audio as good as any studio quality.
-Was the FM signal being detected (converted to am) by the TV receiver's rf/mixer stage?
-No it was not. Worked just as well fed into TV i.f. strip.
-Does the Gunnplexer signal include a large am component?
No it does not. Virtually zero beyond 1 kHz from carrier.
Does the Gunnplexer 10 GHz mixer create an am signal?
-Highly unlikely. It is a low Q very broad (500 MHz+) circuit.
-Could the Gunnplexer i.f. preamp somehow generate AM?
-No. It works just as well without preamp on short ranges.
-Ok! Just how does it work?
-It probably is simple TV set i.f. amplifier slope detection on all 6 TV sets tested. Flat i.f.'s are just folklore!

SUMMARY

Well, now, the cat is out of the bag, the fat in the fire, or what-have-you. There is nothing sneaky, tricky, or difficult about building a FM/FM TV data link system whether you want only to cross a narrow river, a 2 mile lake, a 5.5 mile relay, or to the neighbor down the block. A fascinating aspect of this discovery which we have modestly named the "Richardson Effect" is that even **without** proportional temperature control or automatic frequency control (AFC), a single GPX receiver may be easily tuned to receive 7 different TV channels (a guard channel is placed between each active channel if no AFC or proportional temperature control is used; i.e., active channels would be 2, 4, 6, 7, 9, 11, &13 Next month we will cover schematics and construction detail of the basic system.

RICHCRAFT ENGINEERING LTD.

Richcraft Engineering, Ltd. offers you a no-charge computer generated printout of a) true heading, b) elevation and c)range from your location to: COMSTAR I,II,III;SATCOM I,II,III & WESTAR I,II,III. Please include your location's longitude and latitude (from a road atlas OK) and $5.00 to cover postage and handling. Send to Richcraft at Drawer 1065, Chautauqua, N.Y. 14722 (telephone 716-753-2654).

SATELLITE 'Ham' NET

...meets Sunday at 1900 Z on 14.311 **or** 14.343 (latter frequency when 14.310 is busy with emergency phone patch traffic). Net control is either W5KHT (Coop), W5JG (Lindsey) or KA4BCF (Lib Coleman). Typical check-ins include Robert Coleman (K4AWB) for those working on TD-2 Conversion.

TECHNICAL NEWS NOTES

Security of satellites starting to concern government officials charged with responsibility of implementing **Emergency Broadcast Service** (EBS). EBS exists to provide emergency radio broadcast to public in time of national disaster such as nuclear war. System is headquartered at Cheyenne Mountain, Wyoming and Mt. Weather near D.C. In event of attack, normal radio broadcasting would cease and via terrestrial (landline) interconnected EBS network citizens would receive official government news. Unfortunately system is married to AP and UPI news **wire** services terrestrial lines. If radio stations switch to satellite and drop terrestrial wire service inter-connects, EBS would have to switch to satellite as well. One well placed blow from enemy would wipe out whole national system by downing satellite.

Space Shuttle program continues to suffer setbacks; most recent first week of November when engine test failure destroyed motor. Liklihood that President Carter will approve and urge Congress to approve an additional billion dollars to get program back on track is high. Meanwhile Canada's Telesat has asked European Space Agency for proposal for Telesat ANIK DI and D2 launches in 1982. DI and D2 are 4 GHz replacements for ANIK A series 4 GHz birds.

Pricing on Microcomm receiver modules due to increase this month. Modules have been produced by H. Paul Shuch's San Jose, California firm during summer and fall but manufacture shifts to International Crystal Manufacturing, Inc. (under licensing agreement) by first of year.

PRIME TIME SUNDAY - Coverage of SPTS '79 and private TVROs now rescheduled December 16 or 23; check your TV Guide listing.

Scientific-Atlanta has a new 150 page satellite products catalog. Write for no charge copy from Mickey Hudspeth, Scientific-Atlanta, 3845 Pleasantdale Rd., Atlanta, GA 30340.

FOR YOUR EARTH STATION, CHOOSE

AVCOM'S PSR-3

SATELLITE VIDEO RECEIVER

DESIGNED FOR YOUR PRIVATE TERMINAL

- Remote tuning
- Dual video outputs
- Exclusive Clamp-Sync & Scan-Tune
- Many other features!

AVCOM of Virginia, Inc.
10139 Apache Road, Richmond, VA 23235
(804)320-4439

COOP'S COMMENT ON PROGRAMMING

IN AGAIN / OUT AGAIN

Following the October 18th FCC deregulation decision Scientific Atlanta President Sidney Topol told a group of security analysts in New York City that he was very 'upbeat' and 'pleased' with the FCC decision. He reported that HOMESAT had sold 25 private (home) terminals to that point (and we assume proceeded to license each), but with the decision he anticipated HOMESAT would sell 'thousands more'. On the question of 'piracy' Topol said "**it is solvable**".

One week later S-A announced they were pulling out of the direct business; they will no longer solicit nor accept orders from people who want private terminals. Topol said "**We do not intend to become part of an industry where signals are pirated**". Apparently the piracy 'problem' was not so solvable afterall.

What is the piracy problem?

Simply this. Satellite signals extend in coverage from near the Artic Circle on the north to northern South America on the south; from Bermuda and points east to Hawaii and beyond. Anyone with a receive terminal that is properly engineered for the location can tune in anything on any satellite that is within 'eye-shot'.

Most of the really appealing material on satellites these days is up there for either private use, or public use; but the high interest public use material has a fee attached to it. Cable companies collect a fee for their services and this is their measure of control of illegal reception of services. It is worth noting that Chris Smith, editor of the cable operator's **TVC** magazine talks in his November 1st editorial about an"**estimated 2,000,000 illegal homes connected to cable nationwide**". If only 10% of these homes, connected illegally to cable, are ripping off a premium service such as HBO, this little breach of security is costing HBO and the cable operators a tidy $2,000,000 per month.

Sid Topol says that from hence forth HOMESAT will distribute terminals only through cable firms. HOMESAT recently sold $5,000,000 in private terminals to Tele-Communications, Inc., a Denver based communications conglomerate. HOMESAT's Dick Campbell tells us that TCI will **only** lease HOMESAT terminals to homes and ranches "**because in that way they can guarantee payment to the program suppliers on the satellite**". In essence, if the ranch owner doesn't pay for what he watches, TCI will march in and yank out his dish antenna.

Topol backs this up with the comment "**Cable operators are natural allies in HOMESAT marketing because they've spent the last 20 years figuring out how to bill customers**". Topol apparently doesn't know about Christopher Smith's estimation that 2,000,000 U.S. homes are illegally hooked to cable.

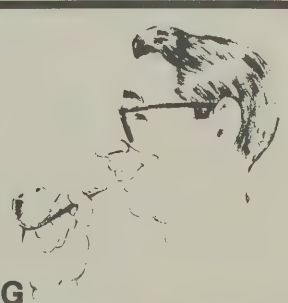
Plainly people are worried about security. HOMESAT once thought that one of the best ways to get people to pay was to offer to supply them with a program guide or schedule for the various services subscribed to as part of the annual fee. That was before the New York Daily News, the New York Post, the Fort Lauderdale News, The Miami News, The Miami Herald and some 200 newspapers started printing daily listings for SHOWTIME, HBO, Madison Square Garden and others. Now TV GUIDE's New York Metro edition does it too. A week in advance no less.

People...some people, just naturally want to rip things off. If Chris Smith's two million illegal cable homes is close to the mark, that represents 1 home in 8 stealing service (the cable industry is now serving around 16,000,000 U.S. homes). Ronald Reagan in his King Features syndicated column appearing nationally November 6th writes about the problems the New York City Con-Edison power company is having with illegal electrical taps on the line. Con-Ed says they believe one customer in 5 (or 20% of all customers) engages in outright electricity theft or 'meter tampering'. Con-Ed also says they had to increase all of the paying customers service rates by 10% to cover the losses in juice. That 10% figure amounted to $145 million last year. Con-Ed fights this battle by offering 'finder fees' to anyone who turns in someone else who is stealing power. More than 20,000 (!) bounty requests have been received and in court Con-Ed is running about 20% judgements in their favor. Reagan ends his report with the note that until the power company comes up with a tamper proof meter head, the wholesale cheating of the utility lines is bound to continue.

A paranoia is now sweeping the satellite premium program suppliers. HBO never would sign up an individual home. SHOWTIME did until early in November, then it decided to back off also. Warner's STAR CHANNEL now has six paying home customers (at $96 in advance for a year) and they claim they'll continue accepting private home money. HBO is intent on scrambling, even if the scrambling screws up the picture quality for cable firms as well. A recent proposal from Harris to HBO spells out how HBO should close this security breach.

And so the games go on. Perhaps Con-Ed has the answer; simply raise the fees a few percent to cover the losses. Not a very pretty statement on our 'democracy' but perhaps the most practical answer of all.

CSD PROGRAMMING



COOP'S SATELLITE DIGEST (Programming Edition) is produced monthly by Satellite Television Technology, P.O. Box G, Arcadia, Oklahoma 73007 (405-396-2574). CSD is available in two separate editions (Programming and Technology) or as a combined subscription. Subscription rates are $30 per year for first class mail delivery within U.S.A. or Canada for either edition, or $50 per year for the combined editions. Outside U.S.A. or Canada add $25.00 per year for any subscription. All subscriptions to be paid in advance in U.S. funds drawn on a U.S. bank; no invoicing.
Contents are Copyright 1979 © by Statellite Television Technolgy and any duplication or reproduction in any form without written permission is a violation of Federal Statue (17 USC 101 et seq.).

WHAT FCC DEREGULATION REALLY MEANS

As reported in the November issue of **CSD** (see Coop's Comment On Technology, page T1) the FCC on October 18th finally determined under Docket 78-374 that people or firms wishing to engage in satellite reception (video, video plus audio, data, audio only, etc.) need no longer obtain an FCC construction permit (and license) for their receive-only terminals. Ostensibly, happy days are here again.

The Commission's decision was not unexpected. Rumors in Washington and the industry have been forecasting just such an action for many months. If there was anything surprising about the decision, it was the frankly sloppy way it was handled by both the Commissioners and the staff. Clearly, for those who had either the opportunity to attend this 'open session' of the Commission, or who have had the opportunity to view the (black and white) videotape acquired from the FCC's library, not everyone participating in this 'great decision' was up to speed on either the questions nor the importance of the issue.

Even if you were on hand, or viewed (and reviewed) the videotape of the event, the meeting itself was confusing. Only a couple of Commissioners seemed to understand what the issue was and the staff presentation fell short because it addressed only the singular issue of "licensing **or** no licensing". As the transcript of the session reveals (see later portion of this report) having determined that no licensing would be mandatory in the future, the staff was not prepared to deal with the next phase of the deregulation. Additionally, the question of dealing with obtaining program rights viewing permission was scantily discussed with the off-handed remark by one Commissioner and agreement by a key staff member that encryption was the logical answer to 'pirated viewing'.

From the private terminal operator's vantage point, the decision was so 'black and white' (i.e. cut and dry), by a 7-0 unaminous vote, that it seemed almost too good to be true. "Where were the 'hidden restrictions . . ." we kept asking ourselves. "Surely someplace in here they want us to REGISTER the non-licensed terminals . . .". Well, if they do, that will come later. For right now and until the staff can put together a document for Commission approval creating a registration procedure and process, there is simply nothing for you to do but build your terminal, and having obtained the written permission of at least one program supplier, turn the terminal on. That's all there is to it for now.

WHAT YOU GIVE UP . . .

At the present time you have two possible routes to follow in activating any TVRO / ARO terminal.

1) Just build it and turn it on;
2) Go through frequency coordination, paper engineering and FCC application and obtain a license.

(A third way is to obtain an experimental/developmental license under Part 25; which would now seem to be largely a waste of time since you receive no special benefits for following this approach and indeed must re-new the license each year with accompanying reams of paperwork.)

If you just build the terminal and turn it on, you have no right now or at a later date to complain to the FCC about whatever (terrestrial) signal interference as you might encounter. If your terminal gets zapped by a Bell microwave circuit or some other licensed terrestrial transmitter operating in the 3.7 to 4.2 GHz range, that's your tough luck. It will be your responsibility to solve your own problems since the FCC has not licensed you; and cannot help non-licensees with interference problems.

If you wish to have FCC sanction for the terminal, the new deregulation ruling changes the rules a bit. For example:

1) **You may construct the terminal as you wish,** while indeed you are preparing and filing your lengthy license application with frequency coordination. While the terminal is operating with**out** a license, you have no FCC recourse for interference. **After the license is granted,** the FCC will see that no new terrestrial microwave sources are authorized which might interfere with your reception.
2) **If you already have a license** and wish to modify it so that some other (business) entity will share the terminal with you, you no longer need to get a formal modification of your license. Just go ahead and plug the other guy in. (Non-licensed terminals can of course share with anyone they wish without restrictions.)
3) Up until now all TVRO/ARO licenses have been for three year terms. From now on the licenses are granted for five year terms.
4 When a current license does finally expire, the licensee can either renew the license (and maintain his 'protected status') or he

can simply fail to renew. By failing to renew you lose your protected status.

5) When submitting new applications for new CP/licenses you no longer need file financial and economic support data (i.e. data which shows that you have the financial ability to build the station and to keep it running); and you also don't have to file FCC Form 403 which is your 'character qualification' data.

Anyone with a license application pending at the FCC at the time of the decision had the option of either leaving the application in place or simply asking for it back. For those wishing to trace the language of the decision, apart from the dialogue report tendered here, the FCC Report and Order file number is 79-665.

In an attachment to the release made by the Commission in this area, Chairman Charles Ferris noted:

"It is often more costly to undertake FCC licensing and frequency coordination than to relocate an occasional earth station if the need arises. Frequency coordination, an essential prerequisite to licensing, may cost as much as $3,000 per station. With hundreds or thousands of stations . . . it might make better economic sense to move those few which receive interference than to pay hundreds of thousands of dollars for the frequency coordination for all of these stations".

Perhaps the most organized effort to get deregulation through has come from the radio network people. The Mutual Broadcasting System (MBS) in particular has been held back at the starting gate for nearly two years with its plan to install approximately 500 audio receive only (ARO) terminals at radio stations throughout North America. Most of these terminals are to be 10 foot dish systems with 200 degree range Kelvin LNAs and relatively simple audio demodulator systems. Mutual had sought a waiver of both the FCC's licensing and the FCC technical standards for this network. Under the October 18th decision not only are new installations given the right not to obtain a license, but they may now also install whatever antenna size, LNA noise temp and receiver threshold they wish. Under the licensing scheme every system has been forced to paper engineer their system so that it maintains a 3 dB excess carrier margin above the receiver's FM threshold point. Under the decision, an unlicensed terminal can operate all of the way down into the sparklies if it wishes; the Commission cares not.

The essence of the October 18th meeting follows. This text was transcribed from the black and white videotape CSD obtained of the Commission's session. Those readers interested in having their own second generation dub of this historical FCC session should contact Susan Cooper at CSD.

10/18/79 - FCC/WASHINGTON, D.C.

Chairman Ferris:

The meeting will come to order. The first item for consideration this morning is the Common Carrier Docket number 78-374...the regulation of domestic receive only earth stations. Bill...

FCC VIDEOTAPES OPEN PROCEEDINGS - copy of tape dealing with deregulation of small earth terminals was obtained by CSD reader Paul Fox who attended the October 18th meeting.

Staff:

Mr. Chairman, Jane Mago will present this item for us.

Staff:

Good morning. The proceeding which produced the item before you today began last November when the Commission adopted a Notice of Inquiry and asked for public comment on the possible deregulation of receive only earth stations. There was a very large response from the request. The commentators took many positions but the majority favored some form of deregulation. As a result, the staff proposes the following deregulatory action.

First, adoption of a policy of voluntary or optional licensing giving the station operator a choice of whether or not to seek protection from interference which licensing provides.

Secondly, elimination of the construction permit requirement for those who do choose to be licensed.

And third, elimination of a modification of the license to initiate cost sharing non profit use of the earth stations.

Fourth, we suggest a reduction in the amount of information required in a license application. In addition, the staff suggests that further deregulatory steps may be taken through a Notice of Proposed Rule Making which is being prepared.

Focusing first on the optional licensing program; the Bureau proposes a policy whereby the station may choose to seek protection from the interference that may result from terrestrial transmissions through frequency coordination and Commission licensing. Those who seek protection will continue to be licensed; those who do not seek protection will operate at their own risk. If interference occurs at the unlicensed site, the unlicensed operator will be required to bear the burden of relocation or shielding.

The advantages of this proposal are that first it provides freedom of choice for the station operator. Secondly, it enables operators who seek protection to obtain that protection through the Commission's processes. Thirdly, it enables the Commission to maintain our control over the management of the spectrum space. Fourth, it maintains our satellite policy objectives of encouraging entry into the market and encouraging technological development. Fifth it maximizes the opportunities for large system users to develop with the least regulatory restraint.

Parties raised two objections to this proposal. First, the terrestrial operators fear that unlicensed receive only operators will attempt to deny terrestrial applications where they see that these applications may cause interference. We

considered this argument and concluded that although such objections may be raised, we will state that they will not be considered placing these operators on notice that they are taking a chance; that they are operating at their own risk and they will not be allowed to present objections to the terrestrial applications.

Commissioner:

But what happens if we register a small earth station operator, what happens later on if you have a terrestrial application for a microwave? Will that (terrestrial) operator take precedence over the registered satellite (terminal operator?

Staff:

Well, the frequency coordination process as it is operated now requires licensing. If you went to a registration scheme someone who is registered would still be within the frequency coordination process and have the protection...

Commissioner:

I realize that. But what happens if after we register the earth station you (then) have an applicant for a terrestrial microwave? Who takes precedence there?

Additional Commissioner:

There is no registration (process) in this proposal...

Commissioner:

Yes, he will be registered.

Staff Member:

There is a proposal in the item to have a look at a registration scheme which I think conceptually is not too different from registration of deeds. I think that is a bridge we have to cross...we will want to cross it someplace. Under the present proposal if someone were to choose voluntarily to obtain a license, go through the frequency coordination process, that earth station would continue to have priority, would continue to have precedence over a terrestrial applicant.

Staff:

As the frequency coordination process works now, Commissioner, usually an accomodation is reached between the parties. There is a type of right that exists but there is an accomodation generally...

Comissioner:

Yes, well you see the item...at least it was not clear to me what precedence would be assigned...what priority would be assigned later on if we go to the registration means. It seems to me that an applicant for terrestrial license might be able to overcome the registered earth station. We haven't made up our minds on that (have we???)...

Staff:

We haven't...but perhaps it would be helpful if we worked up some additional language that explained a little more fully the...what the forthcoming proposal will entail. I agree with you, to some extent the explanations that surround the discussion of the forth coming rule making are very skeletal and they really are subject to some confusion, some mis-understanding.

Commissioner:

I didn't mean to criticize. I just didn't understand.

Staff:

The second argument which was raised against the optional licensing program concerned Section 605 of the act, which prohibits the interception and use of signals. The parties here argued that mandatory licensing should be maintained as a means of enforcement of Section 605. We considered the argument here and concluded that licensing was not required to enforce 605; that the adoption of a voluntary licensing program removes only one weapon from the arsenal of tools for enforcement purposes and that is the option to revoke the operators' license. Other remedies including civil lawsuits, criminal lawsuits, copyright proceedings, and the possibilities of issuance of forfeitures or cease and desist orders still exist. Therefore we conclude that licensing...mandatory licensing, was not necessary for this purpose.

Our other suggestion, including the elimination of the Construction Permit requirement, reduction of the amount of information to be required and removal of the requirement that operators modify their license to implement non-profit cost sharing agreements with unaffiliated parties are designed to lessen the administrative burden on the applicant. No objections were received to these changes.

There have been a number of editorial changes suggested by the General Counsel's Office which were circulated to you yesterday. These changes make no substantial difference in the outcome of the item. The (Common Carrier) **Bureau therefore recommends adoption of the item with the proposed editorial changes.**

Commissioner:

Just what is the ... amplify the place of registration in this continuum of proposals you have before us. Is registration a viable option from the standpoint of what you are proposing today, or not? And if it is, just what role is it going to play in the rights and the roles of the various hierarchy of receive only earth stations?

Staff:

We see registration as the next deregulatory step which might be taken. It cannot be taken here because we don't have the proper proceeding. It would have to be done in a Notice of Proposed Rule Making. This step would essentially be a lessening of the burden on the applicant. It would maintain the protection which presently exists under the licensing program and it would then be an optional program; you would not have to be registered under this...

Commissioner:

I ask the same question the Chairman did. It is not clear whether or not we are going to afford total protection to an interested applicant over a subsequent terrestrial applicant. We haven't made up our minds on that...

Staff:

No, we have not. Commissioner...

Commissioner:

Therefore we cannot today say what kind of protection we are going to afford to the small earth station...

Staff:

That would be the subject of the next proceeding.

Staff:

Commissioner Fogarty, I think as a point of clarification one of the matters that the subsequent proceeding will consider is who can be afforded protection in addition to the degree of protection that might be afforded under a subsequent registration scheme. For example, now, prospectively under the optional licensing program we will permit individuals to license their earth stations as long as they meet the technical requirements and fulfill the coordination (requirements) **as they are required to do under the licensing program. However, under the subsequent proceeding the Commission will want to look at whether we should have certain classes of users who would be entitled to protection and some that would not.**

Commissioner:

What would be the value, if someone decided to follow the option of not getting a license, putting up an earth station and then...what's the downside of just submitting a registration if you are going to afford a frequency coordination subsequently? I don't quite understand why that would be an option. I don't know why anyone would not want to register and then have protection.

Staff:

That's correct. The option of a frequency coordination is a viable asset to a receive only earth station, however there are locations throughout the United States, especially in the mid-west and in the central states where the operator may conclude that frequency coordination is not an asset that he required. Specifically, it may be a dollar amount value which for economic reasons he may elect not to do it. The earth station costs are being reduced quite considerably and the cost of frequency coordination is, again, taking a higher percentage of the total cost.

Commissioner:

That is if you require frequency coordination prior to permitting an earth station to go into operation. The sytem that is described as a potential option of letting it go into operation and then submitting a registration is just putting the frequency coordination behind the operation of the earth station and it

seems to me that you are going to have your glut later rather than now. If that is a viable option with respect to registration and then protection under frequency coordination, I don't see what the real value is other than just dealing with a backlog (of applications).

Staff:

Mr. Chairman, I think that the...again, I appreciate we have a general problem in the sense that we introduce the concept of a registration plan without any real description surrounding it and indicate that the Commission is going to consider this at some point in the near future. I think that part of what that is trying to get at is a very serious concern about what classes of earth stations...receive only earth stations, if any, ought to be entitled to some sort of frequency protection which is obviously a valuable economic asset. And, under what terms and conditions. And it struck us that we didn't presently have the record that would permit us to come to the Commission with any set of proposals that could be adopted along those lines. It is a question that has a great many subtleties connected with it. I would concede there surely is a is a great deal to be feared about any system that would permit somebody to simply send in postcards and capture the economic right to non-interference for any given area.

Commissioner:

Thats exactly why I...it seems to me that a great case is going to have to be made, to me, to justify a system like that. Either you are going to say 'You do it at your own risk and you get no subsequent protection'...and to me that makes sense. But if you say you can subsequently send in a postcard (that says) 'I have just put up this earth station' and have any expectations of protection in the future, to me just doesn't make any sense...

Staff:

Yes, well Mr. Chairman what I think we will do is...we'd be happy to sort of fill in the skeleton a little bit in this present proposed order; but also obviously the Notice we bring up for your consideration later will try in some considerable detail to spell out the various possibilities. The system that is being proposed here is one that has a good deal to recommend it because it is one that essentially gives the consumer its choice about whether or not it is worthwhile, as an economic matter, to obtain this right to non-interference. I think there's a good deal to be said for that; there are interesting questions about eligibility which the subsequent Rule Making proceeding would have to address if we are going to take any finer cut at it than the one that is before you right now.

Commissioner:

I just wanted to say that when Commissioner Fogarty raised this question with respect to registration and the subject of protection, I immediately had this notion that this would not be a viable option. It wouldn't make much sense if that were the case. Because a registration program that afforded subsequent protection just really wouldn't, to me, make a great deal of sense from the standpoint that what we have is status quo.

Commissioner:

So what protection are we going to afford the non-mandatory licensee under this item?

Staff:

None.

Commissioner:

None?

Staff:

None...

Staff:

No, wait a minute. The non-mandatory licensee? The one who chooses to be licensed?

Commissioner:

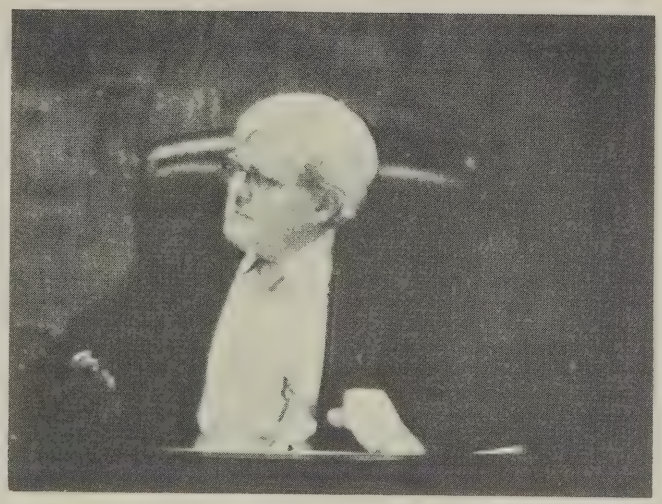
Yes...

Staff:

He will get the same protection we have now.

Commissioner:

Do receive earth stations typically radiate significant spurious RF energy?



COMMISSION CHAIRMAN CHARLES FERRIS opens the meeting ...

Staff:

No sir, none at all.

Commissioner:

What about pirating? Won't this make it easier for that to happen?

Staff:

That's the 605 issue which we discussed late in the presentation. There may be a greater proliferation of earth stations here. However, the only enforcement tool we have taken away here is the option of taking away the license. Any other enforcement mechanism against the piracy will still exist.

Commissioner:

I suppose that encoding and encrypting is the only answer to this...

Staff:

That certainly is an option that is available to the program suppliers.

Staff:

Commissioner, I'd like to agree with that statement very-very heartily. In the final analysis the economics may not be too favorable right now; at this moment. I think that encoding and encryption has got to be the answer from the

STAFF MEMBER JANE MAGO brought the matter formally to the Commission's attention.

SATCOM FI Transponder	Service Name	Fee	Address
1	KTVU	$60 per year	(*) Mr. Al Parinello, Warner Cable Corp., 75 Rockefeller Plaza, N.Y., N.Y. 10019
2	PTL	free	Mr. Gary Deaner, PTL Satellite Network, Charlotte, N.C. 28279
3	WGN	$60 per year	(*) United Video, Inc., Suite 215, Tulsa, OK 74135
5	STAR CHANNEL	$96 per year	Mr. Al Parinello, Warner Cable Corp., 75 Rockefeller Plaza, N.Y., N.Y. 10019
6	WTBS	$60 per year [*] [**]	Mr. Kip Farmer, Southern Satellite Systems, P. O. Box 45684 Tulsa, OK 74145
7	ESPN	$1.40 one time fee	ESPN Plaza, Bristol, CT 06010
8	CBN	Free	CBN, Inc., Pembroke Four, Virginia Beach, VA 23463
9	Madison Square Garden	Unknown	UA-Columbia Satellite Services, Inc., 5 Fir Court, Oakland, NJ 07436
9	C-SPAN	Unknown	C-Span, Brian Lamb 1745 S. Jefferson Davis Hwy., Suite 308, Arlington, VA 22202
10	SHOWTIME (west)		Not available for private use
11	NICKELODEON	part of Tr. 5 rate	See transponder 5
12	SHOWTIME (east)		See transponder 10
13	TRINITY [KTBN]	Free	Trinity Broadcasting Network, P. O. Box A, KTBN-TV, Santa Ana, CA 92711
16	Fanfare Sports		See transponder 10
17	WOR	$60 per year	[*] Eastern Microwave, 3 Northern Concourse, P. O. Box 4872, Syracuse, N.Y. 13221
18	SIN GALA-VISION	Unknown	Spanish International Network 250 Park Ave., N.Y., N.Y. 10017
20	HBO (spare)		Not available for private use
21	SPN	Free	Kip Farmer, Southern Satellite Systems, P. O. Box 45684, Tulsa, OK 74145
22	HBO (west)		Not available for private use
23	HBO Take-2		Not available for private use
24	HBO (east)		Not available for private use

***There may be a [controversial] $60 per year "Copyright Fee" to be paid to the Registrar of Copyrights as well; see November CSD. **Pending resolution of the Copyright Fee question SSS is not accepting private home viewing contracts for WTBS although they do have an official tariff on file at the FCC for this rate.**

standpoint of program suppliers if they wish to have any genuine degree of security about the theft of their service. Now, at the margins there may be other things that could and should be considered. But I think that is the only solution; perhaps the only solution that will prove to be altogether adequate.

Commissioner:
Well, since I was one of the ones urging from early on that we go down from our limitation of 9 meters to 4.5 meters, I've got to be for this one. It is the next logical step in the chain and it is a good item and I support it. I suppose this means that the individual user of a smaller...he can go to any size that he thinks will suit his requirements?

Staff:
Thats right Commissioner.
Commissioner:
Thats implicit here...is it?
Staff:
Yes sir.
Commissioner:
I asked the Chairman what he thought about this idea. Would it be preferable to send this item out along with the registration Rule Making?
Staff:
Commissioner, I...particularily, in light of this discussion here this morning, can see a lot of merit to that. There is one

reason I would like to urge that...might counsel going out with this. There are proposals before the Commission...that have been before the Commission for some time...the one I am thinking about particularly is the Mutual Broadcasting System plan for a great many earth stations to provide programming to its affiliates...(and these proposals) **might be held up somewhat longer as a result of any delay here. I wonder if maybe we could compromise on our agreement to very promptly get before you the Notice of Rule Making along with some supplemental language indicating a little bit more about what this registration program might include. And if the Commission agrees with the thrust of this item...trying to get it released sooner rather than later.**

Commissioner:
That's OK...I'm alright...

Commissioner:
May I ask some technical questions, in paragraph 40...are we now going to vote to grant an immediate waiver to everyone without anyone applying for a waiver, of the requirement for a construction permit? The langauge is a little fuzzy to me. It says we will grant an immediate waiver...does that mean when you apply, or are we doing it right now, for everyone?

Staff:
Commissioner, I think the answer is that we are doing it now.

Commissioner:
OK. We talked yesterday about using the word 'voluntary' or something like that rather than non-mandatory. I would like it better...this non-mandatory is sort of strange and I hate clerical strangeness at this stage. Voluntary says an awful lot more to me than non-mandatory. Now ask me why!

Staff
Commissioner...we'd be happy to change...

Commissioner:
Well...I don't want to...

Commissioner:
I take it there is going to be a substantial rewrite to meet some of these points and I wonder if we should circulate it...

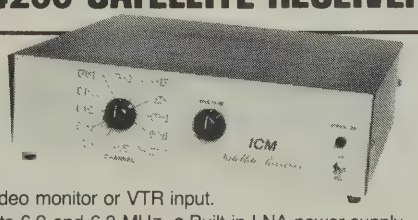
Staff:
We'd be happy to do that.

Commissioner Ferris:
OK. The question then is on the adoption of the Report and Order proposing the immediate implementation of voluntary licensing for receive only facilities and completely deregulating unlicensed facilities...all in favor say aye...all opposed no. The aye's have it unanimously. Thank you.

The next item for consideration is the interim Report and Notice of the Inquiry regarding a study of the corporate structure and operating activities of the Communications Satellite Corporation...(and so it ended).

NEW ICM TV-4200 SATELLITE RECEIVER

Provides You With These Features For $1,995



- Output levels compatible with video monitor or VTR input.
- Dual Audio Outputs 6.2 and 6.8 MHz. • Built in LNA power supply
- Tunable Satellite channels 3.7-4.2 GHz.

International Crystal Mfg. Co., Inc.
10 N. Lee Oklahoma City, Ok. 73102 405/236-3741

ICM

STEVE BIRKILL ON SATELLITE TECHNOLOGY

by
Steve J. Birkill
128 Cross House Rd.
Grenoside
Sheffield, S30 3RX
England

The Russian System of Geosynchronous Satellies

Readers of 'Coop's Satellite Digest' will by now be very familiar with the kind of satellites that bring TV programming to more than 6,000,000 U.S. homes, either via Cable TV, or direct to a rapidly growing number of backyard experimental home terminals. The North American Domestic Communications Satellites, as they are called, operate at synchronous altitude, 22,245 miles above fixed points on the equator, between longitudes 87° and 1326° west of the Greenwich meridian. This point, or 'orbital station' for each satellite is chosen to make the satellite 'visible' from the area it is to serve, as well as to place it far enough away from its neighbors so that, operating on the same channels, interference is not caused. By visible, I don't mean the satellite can actually be seen from the earth - a spacecraft 20 feet wide needs a mighty big telescope to be seen 22,300 miles away -but that its fixed position is high enough in the sky for the receive terminal antennas to have a clear line of fire to the satellite, unobstructed by trees, buildings or hills at any reasonable distance from the antenna, and clear of the terrestrial thermal and man-made radiations that costitute 'noise' coming from the direction of the local horizon and degrading the very weak 'wanted' satellite signal.

These 'Domsats', comprising the RCA Satcom, Western Union Westar, AT&T Comstar, and Telsat Canada Anik systems, all operate in the 3.7 to 4.2 GHz downlink band (their uplinks are in the range 5.925 to 6.425 GHz) with 12 or 24 transponders, each of 36 MHz nominal bandwidth. A great many of the available transponders carry FM television, either on a dedicated basis or for a large percentage of the time, and again the majority of these TV signals is in standard 525-line NTSC color format, with accompanying audio riding on the video as a subcarrier at 6.2 or 6.8 MHz. And over the North American area the signal level from every transponder on every satellite doesn't vary by more than 3 or 4 dB above or below an average value of about 34 dBw. Boring? Predictable? Not a bit of it, as anyone reading this will be fully aware. But after a while it may occur to those of an enquiring or adventurous spirit that much of the appeal of direct satellite TV is in the capturing of the extremely weak signals over immense distances with one's own antenna, rather than in the vastly expanded TV programming they provide. So the experimenter, the enthusiast, sets his horizons wider than the number of ball games or first-run movies he can choose from at any one time. In this CSD segment I shall try to inform the experimenter about the other satellite services he or she can seek, outside the American Domestic systems, and present some practical ideas, as well as just a bit of relevant theory, to help in their reception.

In straying outside the 87 to 136 degree west zone we immediately meet diversity rather than uniformity. Suddenly we have a wide range of different signal levels and transmission formats, some similar and some very different to the domsats. So we can expect to have to make some small but necessary changes to our receiving gear to accomodate them.

But fear not - the changes **are** small, and most can be incorporated as switched additions to the existing set-up, so as not to affect 'regular' reception.

So what is there out there? Well, there are other domestic satellite systems also employing dedicated birds, there are regional and global international telecommunications systems. And there's lots of TV. The global communications satellite system, INTELSAT, has a series of satellites stationed over the three main ocean regions, Atlantic, Pacific, and Indian, which carry most of the internal TV, telephone and data traffic, as well as leasing part of their capacity to individual nations for their own internal communications and TV program distribution. (it will be realised that Indian Ocean satellites are out of view from the USA, but I shall make reference from time to time to satellites world-wide, since CSD readership has an international component.) A second global system, Intersputnik, is being set up by the USSR for use by members of the communist bloc. The Soviets see Intersputnik as a rival to Intelsat, offering satellite services to the developing countries, and providing **civil** communications to communist outposts on a global basis. (The Russians, like the West, have their own systems of satellites for military communications.) But easily forgotten is the fact that the Soviet Union had the world's first domestic communications system, Orbita, beginning in 1965 and in continuous use today. In this issue I shall describe these two Soviet systems.

Orbita

Back in the early 1960s the Russians wanted to exploit their newly-developed satellite-launching technology for wide-band communications. In particular they needed a means of carrying Moscow television thousands of miles out to the far-flung communities in the Arctic regions and Siberia, and also of enabling the state newspaper, Pravda, to be printed simultaneously at various centers throughout the Soviet Union. Terrestrial communications were very poor and narrow-band, in the main being confined to voice or telegraphy channels, and circuits capable of carrying video would have been extremely costly to install to all the desired destinations, as well as taking many years to complete.

Satellites were the answer, but a suitable orbit had to be chosen. Most of what had previously been flown were in low orbits around 200 miles in altitude, having the disadvantage that mutual visibility from up- and downlink terminals would have been limited to less than 30 minutes, with the requirement that antennas would have to track the satellite continuously from horizon to horizon at several degrees per minute. Clearly to provide continuous coverage required a large number of satellites spaced along the same or similar orbits, with two steerable antennas at each terminal. Also complete coverage of the Soviet Union would not be possible without multiple hops.

The advantages of the 22,300 mile circular equatorial geostationary orbit were already known - prophetic writer Arthur C. Clarke had proclaimed its possibilities back in 1945 - but the Russians were unable to use it in 1965 for two reasons: their launch vehicle technology was not sufficiently well developed at that time to lift a communications payload into the correct orbit, and, the 45°N latitude of the Baikonur Cosmodrome at Tyuratam meant an extra heavy launcher was required to shift the plane of the orbit into that of the equator. Additionally, the need to serve stations north of the Arctic Circle indicated against an equatorial satellite: above 76°N, elevation angle would be too small to give sufficient ground clearance; above 81°N the satellite would not be visible at all - and this for the most favourable case of both terminals on the same meridian of longitude as the satellite.

The orbit chosen for the Orbita system was highly elliptical, having apogee of 39,300 km in the northern hemisphere and perigee of 538 km in the southern. Orbital period is close to 12 hours, but by giving the orbital plane an

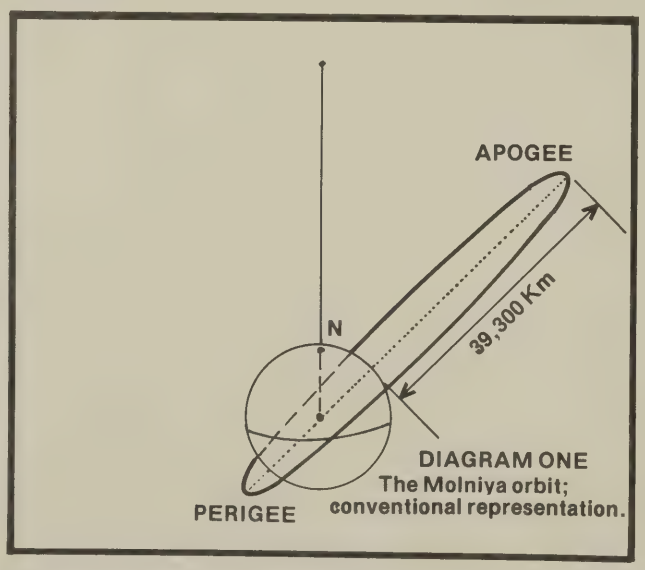


DIAGRAM ONE
The Molniya orbit; conventional representation.

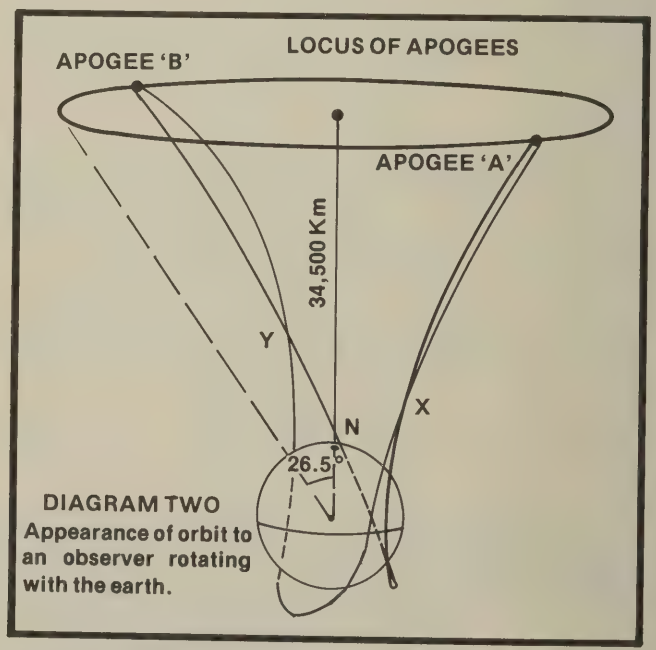


DIAGRAM TWO
Appearance of orbit to an observer rotating with the earth.

Diagram 1 shows the 63.5 degree [approx] inclined elliptical orbit used by Molniya satellites serving the Orbita system. The special features of this orbit are only revealed if it is redrawn as in Diagram 2, showing how the satellite moves with respect to an observer rotating along with the earth, as most satellite earth terminals are constrained to do. It can now be seen that, to a northern hemisphere observer, the satellite doesn't move over a very large area of sky between passing crossover point X going northward, through apogee A, and back to crossover point X going south. And that is the slowest part of the orbit, taking 10 hours. Similarly between point Y and apogee B, 180° removed in longitude. So for stations in view of apogee A the satellite is available for something like 10 hours out of 24, the 10-hour period occurring at the same time each day. The locus of the apogees of all possible such orbits is a circle with its center on the earth's axis, 34,500 km directly above the north pole. This circle, though not itself a possible orbit, can be likened to the familiar geostationary orbit in that positions can be assigned along it to satellite systems, spaced apart on a non-interference basis. The phasing of satellites along adjacent orbits can be seen as analogous to the operation of low-inclination geosynchronous orbits, as used by Gorizont. The Molniya type orbit could serve instead the Antarctic regions, by having its apogee arranged to be in the southern hemisphere. I am unaware of any satellites in such an orbit.

inclination of 63.5°, synchronism with the earth's rotation was achieved. The effect of this was to place every **second** apogee point above the same place on the earth's surface. For a period of 5 hours either side of this apogee, the satellite appeared to remain within a few degrees of the apogee point, in the observer's sky, as its orbit kept pack with the earth's rotation. Outside this period, it would sweep away to its perigee in the southern hemisphere. Since apogee occurred over 63.5°N, the point was visible right over the north pole and the desired area could be covered. The characteristics of the orbit meant that with 3 satellites equally spaced, 24-hour coverage was achieved.

It was into this orbit that Molniya-1A was launched in April 1965, to be followed by several similar satellites over a period of a few months. The Molniya-1 type satellite (Molniya means lightning) is a conical cylinder of 3.4m length and 1.55m diameter with 6 deployable solar panel arrays extending from its base, windmill-fashion. Three-axis stabilised, the spacecraft carries a par of 0.9m dish antennas giving visible-earth coverage at 800-1000 MHz. 40W TV transponder power gives 31 dBw EIRP at beam-edge, a healthy signal at UHF.

The capacity of the Orbita system was increased in 1971 with the introduction of the Molniya-2 series, operating in our familiar 6 GHz uplink, 4 GHz downlink band. At first the series 2 birds were interleaved with series 1, two of each maki ng a set of four on each orbit, compared with Molniya 1's original three. Subsequently the series have gone their separate ways, with several sets in simultaneous operation in spaced orbits. Molniya 3's were introduced in 1974 with further increased capacity. With an operational life of some five years, over 70 Molniyas have now flown. The Orbita receive-only terminals are equipped with 12-meter antennas, and feed cable systems or rebroadcast transmitters. Aroudn 100 Orbita receiving stations are in service in the Soviet Union.

Intersputnik

The Russians achieved geostationary orbit capability in 1974 for communications satellite payloads. Launch capability was tested with the Cosmos 637 and Molniaya S1 flights, after which the geostationary program commenced in earnest. To date three classes of geosynchronous comsat have entered service: Raduga (rainbow) is geostationary, operates at 4 GHz downlink frequencies and within Intersputnik; Ekran (screen) is also geostationary but is a direct-broadcast TV satellite in the UHF band; Gorizont (horizon) is the most recent addition and, while geosynchronous it is not truly geostationary, in that its orbit traces out a figure-8 ground track about a fixed point in the sky. The Raduga and Ekran spacecraft are given flight numbers, and once in orbit they are re-assigned a Statsionar (stationary) number according to their orbital position. Thus for example Statsionar-2, at longitude 35°E, was initially Raduga-2. When that satellite reached the end of its operational life, it was replaced by Raduga-4 still at 35°E and still designated Statsionar-2.

The situation is complicated by the fact that Raduga-2 appears to have initially designated Statsionar-1B, and the possibility that Raduga-3 also played the Statsionar-2 role.

SOVIET SATELLITE TELEVISION received by Steve Birkill in Sheffield, England from Statsionar-4 located at 14 degrees west over the Atlantic. Frequency in 3,845 MHz. Program is sports news and reception was this past September. Birkill 4 GHz terminal uses only an 8 foot dish and 180 degree K LNA indicating that the same satellite, well above the horizon for eastern U.S. and Canadian observers is a good 'target'.

Information is sparse, and there is more to be discovered, but the situation as I understand it at present looks something like:

Satellite	Statsionar designation	Longitude	Launched	Out of Service
Raduga-1	Statsionar-1A	80oE	Dec. 75	Mar. 78
Raduga-2	Statsionar-1B	35oE	Sept. 76	Nov. 78
Raduga-3	Statsionar-2	35oE	July 77	
Raduga-4	Statsionar-2	35oE	July 78	
Raduga-5	Statsionar-1 or -3	80oE or 85oE	April 79	

In recent months it appears that the **Statsionar-4** position at **14oW** (over the Atlantic) has become occupied, but without a Raduga-class launch to account for it, so it may be that information on Radugas 3, 4, and 5 is incorrect, or that some changes in orbital station have been made. The most feasible solution to be (though it's just a guess) is that Raduga-3 occupied the Statsionar-3 position, Raduga-4 the Statsionar-2, and that Raduga-5 is the new Statsionar-4.

Satellite	Longitude	Statsionar designation	Launched
Ekran 1	99oE	Statsionar-1C	Oct. 76
Ekran 2	99oE	Statsionar-T	Sep. 77
Ekran 3	55oE	Statsionar-5	Feb. 79

If anyone can help to clarify the confused Statsionar information, or confirm frequencies in use by the various series I would be most grateful and would gladly publish their findings.

Future Statsionar slots, due to be activated in 1979/80, are as follows:

Statsionar-6	85 or 90°E	Indian Ocean
Statsionar-7	140°E	Western Pacific
Statsionar-8	25°W	Atlantic
Statsionar-9	45°E	Indian Ocean
Statsionar-10	170°W	Pacific Ocean

It is believed that these will be occupied by a Raduga-type payload, but there remains the possibility of a more advanced higher-capacity satellite being employed.

In the next issue I shall conclude this survey of the Soviet satellites with a look at the channel frequencies used and how to receive them, as well as coverage zones and antenna-pointing angles.

ATTENTION COMPONENT SUPPLIERS

CSD readers with an active hand in the business of supplying innovative microwave hardware parts are encouraged to offer 'sample/engineering sample parts' to contributing editor Steve Birkill in Sheffield, England. Birkill's contributions to the development of hardware for both the 4 GHz TVRO terminals and the new 11/12 Ku band terminals is a matter of record. However, innovative components are difficult to acquire in the U.K. and are often a generation behind those available here in North America. Suppliers interested in seeing their latest 4 or 11/12 GHz components blossom forth into useful microwave satellite TV hardware will do well to place Birkill high on their 'sampling engineer' priority list for both existing and new component parts. Naturally projects developed by Steve end up being published here in CSD

SPTS 80 MIAMI

THE BIG EVENT!

The second international Satellite Private Terminal Seminar (or SPTS for short) scheduled for February 5, 6 and 7 at the Miami (Florida) Bayfront Park Auditorium is well on its way to setting new records in attendance and new technology.

The first SPTS, held this past August in Oklahoma City, drew more than 500 registrants with several hundred additional 'would-be' participants turned away by the full house status. The facility in Miami will handle nearly twice as many people with much larger exhibit facilities **but** there are clear indications that the capacity of the auditorium will be strained. **Pre-registration is mandatory!**

SPTS '80 Miami will be conducted along lines proven successful in Oklahoma. There will be parallel sessions with a 12 lecture symposium delivered by H. Paul Shuch in one area of the auditorium simultaneous to roughly an equivalent number of sessions in the main auditorium. Shuch will be concentrating on teaching TVRO receiving system fundamentals to those with a technical interest in exactly how the system works and why certain design applications are followed. Paul intends to update his August SPTS presentation by bringing attendees into the world of 1980 style ''$1,000 home receiver designs''. Shuch is one of those that believes the engineering community will solve the problems presently separating the viewing public from under $3,000 terminals by the end of 1980.

In a similar technology breakthrough area, hardware developers Taylor Howard and Robert Coleman have been conspiring to create a single refined system for taking the 70 MHz i.f. output (from either a single conversion 4 GHz to 70 down converter system, or, from a double conversion system) and turning it into baseband audio and video. Coleman has worked out a very inexpensive 50 dB gain region i.f. stage board using around $25 of active devices and Howard and Coleman together have completed design work on getting you from 70 MHz down to a good quality baseband pair of outputs. They will be showing and explaining the system in Miami, and they plan to have circuit boards for the builders as well as boards with parts kits and possibly even completed units available by Miami. Combining this 70 MHz to baseband package with Coleman's GaAs-FET front end and active mixer (with the Avantek VTO 8360 VCO), a chap will have a high quality and low cost receiving system.

We expect to see **many** new antennas at Miami. Numerous 10, 11 and 12 foot antennas that have not previously been seen are now rolling out of proto-type shops all across the country. One of the most interesting is an 11 foot petal-bolic that utilizes 24 metal petals to achieve a parabola of revolution. The petals ship via UPS and the 40 pound hub is now being slightly reconfigured so it too will ship via UPS. The user price on this package, which has around 0.75 dB more gain than a 10 foot dish with a 0.4 f to d ratio, is in the $2,800 range. Those who have seen this particular antenna say it looks exactly like a Scientific-Atlanta 4.5 or 5 meter parabolic; except miniature in

FIRST CUT — SPTS '80 / MIAMI PROGRAM SCHEDULE

Here is the Miami program schedule as it shapes up late in November. An updated version of this program schedule, to assist you in making your own arrival and departure plans, will appear in the January issue of CSD.

Time	Tuesday, February 5th		Wednesday, February 6th		Thursday, February 7th	
	Main	Shuch	Main	Shuch	Main	Shuch
8AM-8:50		Videotape		Videotape		Videotape
9AM-9:50	Basic Syst. Language	Spanish - Behar	Taylor Howard	Spanish - Behar	LNA Art	Low Power Relays
10-10:50	FCC Dereg.	Shuch #1	Robert Coleman	Shuch #5	Whats On The Bird?	Shuch #9
11-11:50	License Or Not	Shuch #2	Copyright Status	Shuch #6	Competitive View	Shuch #10
12N-1:45	Exhibit Hall Open		Exhibit Hall Open		Exhibit Hall Open	
12:30-1:30		Videotape		Videotape		Videotape
2PM-2:50	Distributing TVRO Gear	Shuch #3	Oliver Swan	Shuch #7	Business Opportunities	Shuch #11
3PM-3:50	Marketing Experience	Shuch #4	MDS Inter-connect	Shuch #8	The Year Ahead	Shuch #12
4PM-6PM	Exhibit Hall Open		Exhibit Hall Open			
4:30-8PM				Videotapes		
6PM-8PM			Exhibit Hall Open			

size. It cranks through all of the satellites with ease. This particular manufacturer has a capacity of 10 per day which will certainly help put a dent in the delivery problems now being experienced! Another low cost fiberglass antenna series is also going to be shown in Miami; in both 10 and 16 foot sizes. The price is the interesting thing here; around $600 we are told for the 10 foot version.

As exciting as the new hardware is bound to be, the biggest attraction will probably be the direction that programming and programmers are now going. With more and more video activity appearing on the COMSTAR birds, and with each COMSTAR bird holding the capacity to place a 35 dBw or so footprint over the Caribbean, Central America and Northern South America, interest in first-time-television in that part of the world (or first direct English speaking television from North America) is running very high. SPTS '80 Miami will have three sessions pointed at the enthusiast from this portion of the Western Hemisphere; two of which will be conducted largely in Spanish by Bob Behar of A-B Electronics in Hialeah. Behar's sessions will concentrate on "Latin America Satellite Opportunities" (i.e. what signals are available, what equipment is required) and on "Low Power/Low Cost UHF Re-Broadcasting Techniques" wherein he will explain how 10 to 100 watt UHF TV range transmitters can be utilized to re-deliver satellite received signals over a region 5 to 20 miles across. Behar's technique provides for security so that unauthorized viewers cannot tap into the system. Another session, in English no less, conducted by Coop will explain how 2.15 GHz MDS systems can be put into service in remote U.S. areas to delivery satellite programming to paying customers, as well as covering use of 10 GHz range low power / low cost microwave for interconnection of such facilities (where authorized by law).

Early marketing experience, at the national, regional and local level will also be a big part of the program. Since SPTS '79 in Oklahoma last August, hundreds of private terminals have been sold and installed. A panel of people with experience in marketing to the public will illustrate what works and where the pitfalls of selling satellite TV hardware are and how to avoid them.

Oliver Swan will be on hand to conduct another seminar session; he plans to have a trailer mounted Spherical antenna on display and will be talking about how the Spherical in its larger forms can be utilized in the Caribbean and south of the U.S.A.

The SPTS '80 Miami program is now starting to take shape and a 'first cut' of the program appears here this month in table form. An updated version of this will appear in the January CSD.

The increased emphasis on business opportunities in satellite television, at SPTS '80 / Miami, shows that the industry (as young as it is still) is maturing at a rapid rate. The opportunity to be successful at virtually every level exists in this field and all of this and more will come into focus at SPTS '80 Miami where the seminar session teachers, the exhibitors and the attendees will get together to update this explosion in technology!

SYSTEM PACKAGING NEWS

PROFILE OF A SATELLITE NUT

Channel One Inc. (68 Avalon Rd., Newton, MA 02168), the Fred Hopengarten managed firm that is touting $18,000 range private earth terminals for those affluent enough to think seriously about such things, recently conducted a marketing study of just who the person is that has been attracted 'early-on' to the satellite TV field. Bob Cooper provided Fred with 50 very randomly sampled names from persons ordering the 'Satellite Study Package' this past late winter. To these 50 geographically separated people Hopengarten sent out a two page, 10 question marketing questionnaire. To the surprise of Hopengarten and Coop, Fred received 35 responses (70%) and he offered no prizes or inducements!

We present the tabulated results of this study primarily because it offers some insight to those people attracted to satellite TV in its early stages in the first quarter of 1979. Remember please...this was **before** a) SPTS '79, b) Taylor Howard's Manual, c) Robert Coleman's Manual, d) Oliver Swan's Spherical antenna breakthrough, and prior to virtually all of the popular press coverage of this subject. See how you fit into the group!

The sampled group already owned: 1) Stereo gear (100%), 2) Wide Screen TV (23%), VTR machine (57%), CB Radio (46%) and Ham/SWL radios (54%). Additionally, although no check off line was provided 6% said they owned TV games, 17% own computers and 3% said they owned sail boats (!).

Of those responding, 86% owned (or assumedly were paying towards) their own home, and the balance (14%) were renting.

Could a three meter parabolic antenna be placed in their backyards? 91% said yes, 9% no.

Could a three meter parabolic be placed on their roof? 66% said yes (probably before they checked the roof joists!) and 33% said no.

Of those responding that they could either place an antenna in their backyard **or** on their roof, 91% indicated they had a 'clear view of the southern sky' at the applicable 'look angle'.

Would they be prepared to spend up to $18,500 to own a satellite TV receiving system? 4% said they would, 96% said they would not.

(Note: Four percent of the total U.S. marketplace of 65,000,000 homes would still be a substantial market for $18,500 terminals. However, the group can hardly be considered typical with such a heavy advance interest in expensive electronic toys as is evident. The real market for $18,500 terminals is therefore substantially smaller than the 4% indicated.)

SATELLITE TV EXPERIMENTERS
INTRODUCING A COMPLETE
3.7 — 4.2 GHz DOWNCONVERTER
- 3.7-4.2 GHz in, 70 MHz out
- Remote, one control tuning
- Dual conversion - stable
- Assembled & tested Only $895.

Polar Mount and Remote Feed Rotation Plans For Your Dish
SUPER! $10.00 postpaid

EXPERIMENTERS SUPPLIES
- Teflon PC Board dielectric constant 2.55
1/16"x9"x3" (approx.) $14.00
1/32"x9"x4" (approx.) $14.00
- Chip capacitor kit 12 each, 60 total! 18, 27, 39, 220, 4700 pf. Only $18.00
- SMA and microwave connectors, inquire
- 2"x14" copper tube for Birkhill feed, 3 lbs. $12.00

WRITE - We are adding to our inventory!

SATELLITE INNOVATIONS
P. O. Box 5673
Winston Salem, N.C. 27103

Add $2.00 shipping and handling (except for plans)

THIS PRODUCT NO LONGER AVAILABLE

How would they rank, in importance, the satellite TV programs which they most would like to watch? There were eight categories in all and here is how they shaped up:

Number One - Movies
Number Two - News (Ted Turner will love that!)
Number Three - Sports (can you believe news beating sports? This is no typical Archie Bunker group!)
Number Four - PBS (as in educational and cultural)
Number Five - Super Stations (after PBS no less!)
Number Six - Religious Programs
Number Seven - French Programs
Number Eight - Spanish Programs

Where are these people located? 44% said they lived in the suburbs, while rural area (28%) and city (28%) tied for second place.

What about cable TV? 46% said it **was** available in their area. Of those who have it available, 69% subscribe to the service.

Without cable TV, 15% said they receive 3 or fewer off-air stations while 36% have 4 or fewer stations (none received no television).

Having established that only 4% were willing to consider an $18,500 earth terminal, what about easy credit terms? Hopengarten found that stretched over a four year payout period:

80% of those responding were willing to take on time payments, and of those, 45% were willing to pay less than $200 per month (no way of knowing **how much** less!), 39% were willing to pay $250 per month and 6% were willing to pay $300 per month. Just like buying a new car.

And an aside. Many of the respondents took the time to tell the survey takers that they were intent upon building their own terminals. Which is understandable when you consider that all of the early enthusiasts were in fact people who learned of such goings-on primarily through technical trade journals.

So what was the profile of the typical early enthusiasts in satellite TV reception? Well, he (or she; the survey didn't separate the two):

1)Was into electronic gadgets in a big way
2)Owned or were buying their own home
3)Could put a three meter parabolic either in their yard or on their roof
4)Had a clear shot at the southern sky
5;Were **NOT** willing to plunk down $18,500 for a TVRO terminal
6)Wanted movies, news and sports in that order from the satellite
7)Lived in the suburbs
8)Did **not** have cable TV available
10)Were willing to put down something less than $200 a month over 48 months for a TVRO in their yard.

How about it? Does that describe you?

'MOBILE' TVRO SYSTEMS

The popularity of mounting a 10 (or even 12) foot parabolic antenna with 3.7 to 4.2 GHz feed on a trailer, connecting it to a suitable pull vehicle and setting out to demonstrate to the world 'direct' (home) satellite television reception is growing by leaps and bounds.

In Canada, pioneers David Brough and John Kinik are criss-crossing the northern reaches of that country with both flatbed truck and trailer mounted units displaying what amounts to first-time television to dozens of remote Canadian mining, lumber and other (work) camps. As a separate article appearing here this month notes, the appearance of these mobile terminals plus the U.S. television reception they are bringing into Canadian communities is creating quite a stir in Canada.

In the United States numerous trailer rigs are now on the road. The **USTC** (P. O. Drawer S, Afton, OK 74331) 12 foot antenna is now being delivered to 'installing distributors' such as Robert L. Young's Satellite Television Systems (shown here while visiting at the **CSD** Lab near Oklahoma City). This 12 foot all aluminum array carries a distributor price tag in the $2100 region for the antenna (and feed) while the trailer portion of the rig is priced in the $1600 region. These are **not user prices**; rather they are installing distributor prices. The USTC rig is

equipped to travel down the road as you see it; 'stowed' to the side but fully assembled. Young who had hauled it around 300 miles by the time he arrived at CSD's Lab, reported that he wouldn't want to go around bucking strong side winds but with normal weather he was having no difficulty pulling it along at the legal limit. You have to be careful of 13'6'' clearances however!

Out in California, Microwave General (2680 Bayshore Frontage Rd., Mountain View, CA 94043; 415-969-3355) first displayed their ten foot trailer mounted terminal at the San Francisco WESCON show reported in the October issue of CSD Chuck Colby of MG reports the trailer mounted rig, set up on a downtown San Francisco street corner, was a real show stopper with hundreds of people crowded around at times. MG is now offering not only the 10 foot diameter Cassegrain fed antenna but also complete turn key systems. They have packaged a Dexcel 150 degree LNA and the International Crystal receiver into a $6,900 (user net) turnkey price for west coast installation; plus, they have packaged the AVCOM PSR-3 receiver plus a 120 degree LNA and super satellite nut version of the same antenna into a $9,900 (user net) priced package. Chuck reports that there are as many takers for the more expensive package than the lower cost version with installations now in or going in spread from Lake Tahoe to southern California.

The $9,900 priced package has a very clever antenna control system that includes the usual polarization rotation plus automatic (user controlled) azimuth and elevation controls with digital (three digit) read out of the antenna's position at anytime. The user simply runs a couple of small controls at his viewing location and adjusts the antenna heading, polarization and the receiver all from one spot remotely.

MG will be announcing a new 12 foot antenna for those weaker signal areas about the time you read this and Colby reports that with expansion of their production facilities now nearly completed they can turn out a complete antenna in about four hours time.

MG's Colby feels their $9,900 package is in direct competition with the more expensive systems offered by Scientific Atlanta and others and describes business as 'brisk'.

USTC 12 FOOT MOBILE RIG with Reno's Robert Young.

FOR YOUR EARTH STATION, CHOOSE

AVCOM'S PSR-3

SATELLITE VIDEO RECEIVER

DESIGNED FOR YOUR PRIVATE TERMINAL

- Remote tuning
- Dual video outputs
- Exclusive Clamp-Sync & Scan-Tune
- Many other features!

AVCOM of Virginia, Inc.
10139 Apache Road, Richmond, VA 23235
(804)320-4439

Canadian Report On Pirate Terminals

The total failure of the Canadian authorities to grasp the need for live, quality television in Canada's far north has spawned a proliferation of unlicensed satellite TV terminals across remote portions of Canada. Canadian law restricts Canadian viewers from tuning in U.S. satellites but Canadian satellites offer very little in the way of desirable television to these Canadians. Naturally those Canadians with the dollars or knowledge to do so are installing private terminals to tune in the U.S. SATCOM and WESTAR signals. This newspaper report, from a recent Canadian edition, addresses the question of what is bing done (or threatened) as the battle lines heat up in Canada. Keep in mind this is a layman's report appearing in a general circulation newspaper so if something of the fine 'details' don't quite jive, that is understandable.

''CTV Network Ltd of Toronto may seek an injunction against illegal television oeprators in the North by the end of the year unless the federal Government takes action to stop the operators.

John Coleman, CTV director of government and industry liaison, said the private network is thinking of taking legal action to have equipment seized so that broadcasting from so-called 'earth stations' will be stopped.

''Referring to the burgeoning number of illegal receivers, many of them dish-like units that pull in signals from a satellite owned by RCA Corp. of New York, Mr. Coleman said: 'It is a disgrace. The number of these dishes, or TVROs, is irrelevant. The Government is tolerating anarchy as long as it permits this to continue.'

''Bernard Ostry, deputy minister, Department of Communications, said it is 'relatively well known that there are illegal earth stations operating in the North.'

''While no one knows the exact number, Mr. Ostry said he places the total across Canada at between 60 and 70. However, Mr. Coleman said he knows that David Brough, owner of Northern Access Network of Orillia, 'now says he is operating in 50 locations.'

''Mr. Coleman said Mr. Brough's operation, without licensing from the Canadian Radio-Television and Telecommunications Commission, is 'only a case in point. The fact that no network serves some of these communities does not justify the piracy that is going on.'

''Mr. Ostry said most of the stations are in and around the Yukon, 'primarily in mining camps. They range from tiny systems to large ones. Many of them felt the CBC was not giving them the choice they wanted.'

''All of these systems, he added, contravene either the Broadcasting Act or the Radio Act.

"It's a new problem and the solution to it, while it is being addressed, has not been found. There are ethical and moral questions around removing them. I suppose I could enforce the law, but I don't think that achieves very much.'

"Referring to the fact many of the illegal systems are using the U.S. satellite, Mr. Ostry said the international problem would 'expand in the future. The whole question of spillover to other people's satellites is touchy. For 11 years the United Nations has been trying to deal with the implications of direct satellites and has not yet come up with a solution.'

"Mr. Ostry mentioned earlier the problem of negotiating the issue with foreign countries 'when we haven't served the users ourselves with the same choice of signals. Sending in people to close things down is not the answer.'

"No viable alternative has yet been worked out by the Government for people using the systems, Mr. Ostry said. He ruled out a simple private sector solution.

"That becomes a question of who will deal with those 60 or 70 antennaes in the north, who will pay $1-million to beam the signal up to a few thousand people?'

"He said one option under discussion is a package deal with pay-television that could attract other uninterested private companies to provide the service.

"One member of the communications industry offered to supply Report on Business with instructions on how to build a small-sized, TVRO, or dish, it's simple. You just go into an old air force store on Toronto's Church Street, buy a discarded parabolic reflector and discarded receivers, and you can modify the whole works for less than $25.

"The obsolete electronic gear disposed of by the army, navy and air force sells for peanuts. Blueprints are available in the U.S. for $2.50.'

"The same source said the lumber and mining camps use the 'big dish,' about 20 feet in diameter. 'They are getting 20 channels from the RCA satellite, much of it pay-TV for other people.''

PROGRAMMING SERVICE CHANGES & ADDITIONS

HAWKS WTBS SCHEDULE

The Atlanta Hawks NBA basketball season has begun a 40 game series telecasting season on Atlanta's Super Station WTBS. Televised games remaining in the schedule follow:

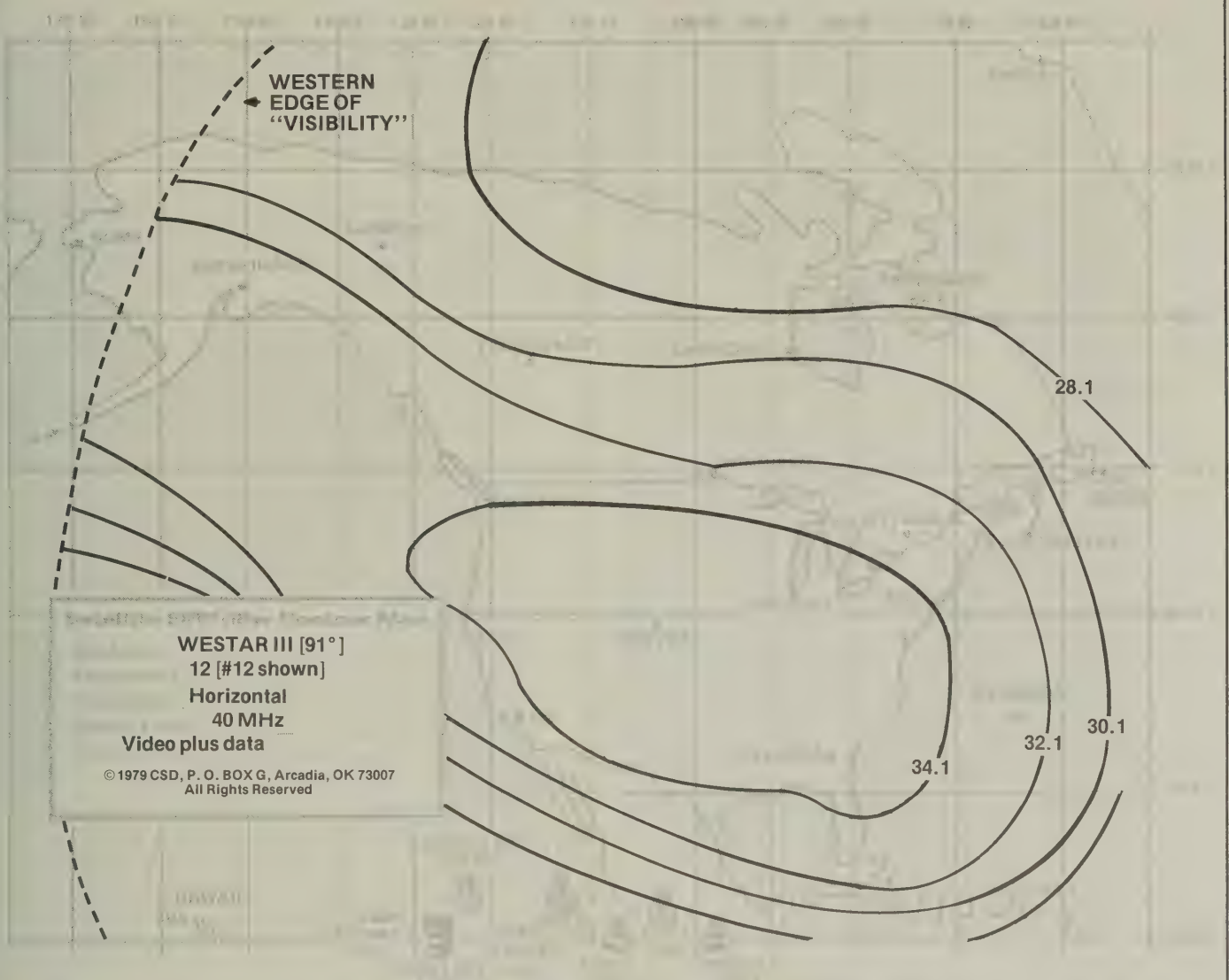
DAY	DATE	TEAM	EASTERN
Sun	12/ 2	Cleveland Cavaliers	7:30PM
Wed	12/ 5	Boston Celtics	7:30PM
Sat	12/ 8	Washington Bullets	8:00PM
Sun	12/ 9	New Jersey Nets	7:30PM
Fri	12/14	Philadelphia 76'ers	8:00PM
Tue	12/18	New York Knicks	7:30PM
Thu	12/20	Detroit Pistons	8:00PM
Sat	12/22	Indiana Pacers	8:00PM
Fri	1/11	Boston Celtics	7:30PM
Sun	1/13	San Antonio Spurs	8:30PM
Wed	1/16	San Diego Clippers	10:30PM
Thu	1/17	Phoenix Suns	9:30PM
Fri	1/18	Los Angeles Lakers	11:00PM
Tue	1/22	Kansas City/Omaha Kings	9:00PM
Thu	2/ 7	Utah Jazz	9:30PM
Sun	2/10	Golden State Warriers	5:30PM
Tue	2/12	Portland Trail Blazers	11:00PM
Wed	2/13	Seattle Super Sonics	10:30PM
Fri	2/15	Denver Nuggets	9:30PM
Tue	2/26	Boston Celtics AT HARTFORD	7:30PM
Fri	3/ 7	Indiana Pacers	8:00PM
Sat	3/ 8	Houston Rockets	9:00PM
Tue	3/18	New York Knicks	7:30PM
Wed	3/26	Philadelphia 76'ers	8:00PM
Fri	3/28	Washington Bullets	8:00PM

BIRD OPERATIONAL NOTES

Twelve hour per day **WESTAR III** movie and entertainment service aimed at 'off shore oil rigs' and other expatriot Americans living away from U.S. mainland is scheduled to begin January first. Firm bringing up service, first of an 'entertainment/direct-view' nature on any WESTER bird, is **Video Communications, Inc.** (VCI, 6585 E. Skelly Drive, Tulsa, OK 74145; 800/331-4077). VCI President Bill Blair reports they will select actual transponder on WESTAR III sometime in December; he is purchasing non-preemptible service (i.e. 24 hour per day, last-to-go class service) and service will be 'scrambled'. VCI has been soliciting bids for total of 500 terminals (3 to 6 meter class) to be purchased first of the year. VCI will supply complete packages to clients and rate structure looks like $.25 per person per day for service. Initial uplink will be from Dallas area WU site but VCI plans to build their own uplink in Tulsa in mid-1980. The firm is also talking, through Western Union, with INTELSAT about plans to provide 3 to 4 hours per day of U.S. TV service in English (using 1/2 transponder format) to Americans residing in North Sea area (oil rigs primarily) as well as Middle East and North Africa. Blair is obviously courting (money rich) oil firms looking for way to create market of his own. He doesn't rule out customers taking his service in Caribbean, Central or South America(plus on mainland U.S.A. at remote lumber camps, etc.) and notes WESTAR III has excellent footprint as far south as Mexico City . Extra bonus for users will be a pair of Tulsa radio stations to be sent along on subcarriers. Tulsa station KVOO (country and western) and KRAV (middle of road and pop music) are strong contenders right now.

Last spring's **transponder 1 interloper** has returned. Incident in early 1979 involved strangely modulated carrier that RCA, FCC and others never did pin down. Effect is white flash rolling through KTVU video at random rate. Best theory at time was interference was mis-directed uplink antenna although 'deliberate interference' theory ran close second. Random dates in early November (including the 6th) had the problem.

Open market source of weekly movie (etc.) program schedules for HBO, SHOWTIME and other premium source



NEW WESTAR III SERVICE - footprint data from official FCC contour maps. Satellite will carry new VCI 12 hour per day movie/entertainment programming for off-shore oil rigs, remote lumber camps, etc. starting January 1, 1980. Although not shown here, service contour at 26.1 dBw level extends into southwestern tip of Greenland including Godthaab, Fredrikshaab, Sydproven. Mexico City level is in 24.1 dBw region. Northern South America [including Venezuela] is far below 24 dBw.

has turned up; **TV GUIDE**. New York City metro edition of newsstand publication now carries HBO, SHOWTIME and Madison Square Gardens. Since anyone may subscribe to any edition ($18 per year from TV GUIDE, Box 400 Radnor, PA 19088) the 'challenge' of finding premium program listing now seems to be resolved for those who are anxious to 'pirate' satellite TV premium offerings. One source reports there has been an increase in 'distant subscribers' to the New York City (metro) edition at TV GUIDE since the premium program listings were added.

RCA now asking FCC for permission to build **SATCOM V** as on ground 'spare'. RCA says they plan use of four primary satellites as follows: **SATCOM FI** (136 degrees - after FIII launch) for cable (11 transonders), Alascom; **SATCOM FII** (119 degrees) Alascom, interstate TV, government data and voice; **SATCOM FIII** (132 degrees) CATV only; **SATCOM IV** (83 degrees, launch 1981) SMARTS (TV broadcaster program feeds), government and commercial traffic.

Some of the new SATCOM users after FIII is launched are starting to be evident. Included is Pittsburgh's **Total Communications System** feeding sporting events (mostly on an event basis; they've been sharing transponder 20 on FI for more than a year), **National Christian Network** (new 24 hour per day religious programming service; the fourth such service) will be on transponder 4 on FIII. Further announcements or 'leaks' will be closer to operational date in February.

Deregulation of receive-only-terminals has re-activated **Mutual Broadcasting's** plans for 650 audio terminals. They say now they will use antennas in 2 (**two!**) to 4.5 meter range depending upon footprint and interference. Mutual expects first terminals installed by January. De-regulation has also prompted some smaller CATV systems to install 4 meter size antennas. **USTC** of Afton, Oklahoma reported it had delivered first such antennas only days after FCC deregulation to cable systems in Georgia and Oklahoma.

FCC issued statement as to 'prior authority' requirements for **licensed** TVROs. If licensee has license covering any bird in operator **family** (such as SATCOM, WESTAR, COMSTAR), no need to get license modified to add additional bird within **same family**. However if system is licensed only for one family, license must be modified to add different family.

Microdyne-AFC reportedly offering to set up firms as 'distributors' for private terminal sales for $30,000 fee. This covers a demo system plus one in stock for re-sale and some spare parts.

TUNING IN THE BIRDS

BASICS FIRST

By measuring reader interest in subject matters not adequately covered in the first two editions of **CSD** one subject area easily dominated our mail-poll; the need' for reliable, accurate data describing what transponders are carrying what forms of (video) programming on what satellites. We suspect this section may ultimately become the most-read and perhaps the largest section in the Programming Edition of CSD. How well it works will depend entirely upon reader research and feedback however since there are far too many birds now operating for any single source or handful of sources to properly log and identify all of the many and varied video sources now present.

RCA SATCOM FI, FII (and FIII after launch and check out) are 24 transponder birds; as are the three COMSTAR machines. RCA and COMSTAR get 24 transponders out of a frequency assignment wide enough for 12 transponders by alternating **vertical** (all odd numbered transponders) and **horizontal** (all even numbered) 'channels'. The two **polarizations** are also offset by 20 MHz from one another. Transponder 1 is 'centered' on 3,720 MHz, transponder 3 is centered on 3,760 MHz (both vertical). Transponder 2 is centered on 3,740 MHz and transponder 4 on 3,780 MHz (both horizontal). They progress upwards to 4,160 MHz (23/vertical) and 4,180 MHz (24/horizontal) in 20 MHz steps, alternating polarizations along the way.

WESTAR I, II and III and ANIK (I, II, III and B) are 12 transponder birds; horizontal polarization **only**. For each, transponder 1 is centered on 3,720 MHz, 2 on 3,760 MHz and so on to 4,160 MHz (transponder 12). Here the step per transponder is 40 MHz.

According to theory, RCA (and COMSTAR) can group six separate downlink transponders to a single downlink antenna and they are always grouped in 6 transponder **sets** (i.e. transponders 4,8,12,16,20 and 24 feed **one** antenna array). This results in slightly different (or widely different) 'footprints' for different **sets** of transponders on RCA and COMSTAR satellites. Also according to theory, WESTAR and ANIK are supposed to have virtually the same footprint on each transponder since all 12 transponders drive the same downlink antenna (pattern). In practice there is some variation noted; up to 2 dB in severe cases.

Programming assignments, transponder useage changes monthly (weekly, daily, and hourly). It is at the option of the satellite operator that any transmissions appear on any transponders. Neither the FCC nor the DOT assign transponders; this is entirely the decision of the satellite operator. Therefore we have a very fluid system in operation.

With that background, these reported observations (published to assist you in determining with precision which satellite you are pointed at!):

STATSIONAR 4: Operational now at 14 degrees west with 6 transponders each 50 MHz wide noted. Channel centers are: (1)3,695 MHz, (2)3,745 MHz, (3)3,795 MHz, (4)3,845 MHz, (5)3,895 MHz and (6)3,945 MHz. Channels 1,4,5 carry SECAM color with 7.5 MHz subcarrier audio (off around 2 PM eastern because of time zones). In Europe 1 and 6 (no video) are the 'hot' ones, perhaps 39 dBw. Others on apparent 'global' beam at around 29 dBw (plenty hot for 10 foot dish and 150 LNA east of line from Chicago to Mobile).

COMSTAR 3: Latest ATT/GT&E bird has been noted carrying video with program audio apparently on SCPC. Apparently no regular video yet up although private video teleconferencing plus all three networks have been observed on **horizontal** transponders.

WESTAR 3: Latest Western Union bird now completing check outs from 91 degrees. Transponder 6 (13 on 24 channel radio) noted carrying CBS news feeds 5 PM eastern and UPI news feeds 6:30 PM eastern most days.

COMSTAR 2: CBS News Tokyo noted transponder 1 recently; other video on irregular basis on vertical set transponders.

WESTAR I: PBS feeds still carried transponders 8, 9 and 11 regular basis; 12 on occasions. Other video seen transponders 1, 2 and 6 occasional basis. Kup's Show originating Chicago's WMAQ noted 3 PM eastern transponder 11 recently.

ANIK B: French on transponder 8 is best signal in U.S.; English (CBC North) on 10 and 12. News feeds seen many days on 4 and 5 in 7 to 9 PM period eastern; some occasional video also on 7, primarily Friday evenings and weekends.

ANIK III: Continues to carry French transponder 8, English on 10 and 12.

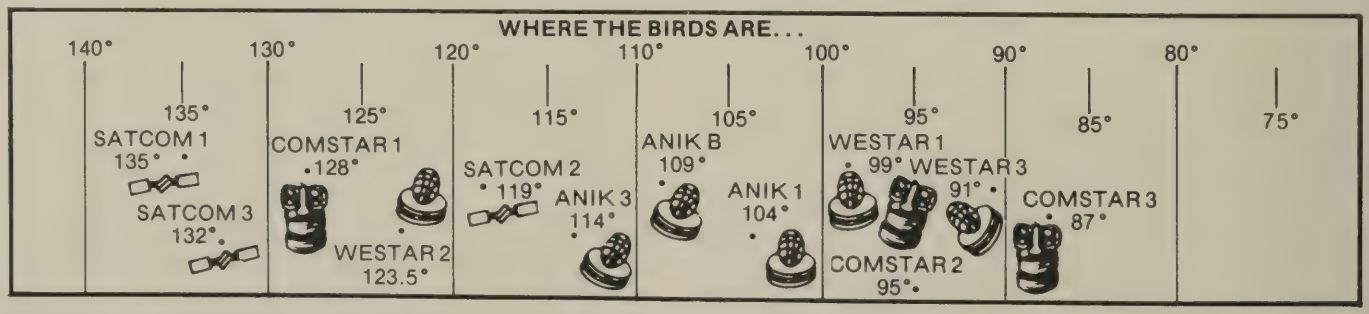
SATCOM FII: Only regular video is transponder 23 Alaskan network feeds extending late into night; daytimes is video being fed into Alaska for taping and later distribution. Transponder 8 still NBC Hollywood/New York feed channel.

WESTAR 2: SIN (Spanish International Net) has extended operating hours to well past midnight eastern on transponder 7. Sports feeds often appear on 12 for independent network stations. News feeds transponders 1, 4 and 12 dominate in 4 to 7 PM eastern time slot.

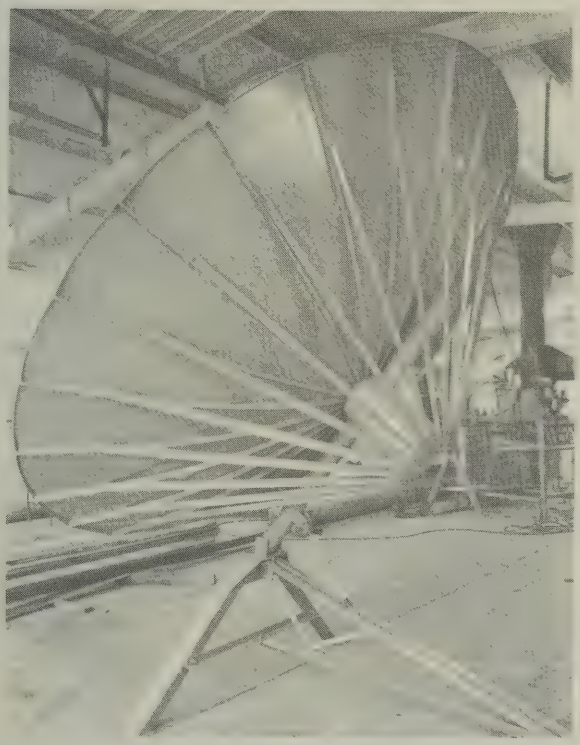
COMSTAR 1: Only very irregular video noted, usually on vertical transponder sets. No program audio on subcarrier(s) noted.

SATCOM FI: Most recent addition has been Appalachia educational program on 16 weekday daytime and Spanish language Gala-Vision on 18 evenings. See page P6 for expanded listing.

CSD welcomes reader/viewer reports and observations. Remember, occasional programs or transmissions are sent on the transponder chosen by the satellite operator and often at a time selected by the satellite operator. And any viewing of any 'private' transmissions for which you have no authority may be a violation of Section 605!



INTRODUCING: ADM's ELEVEN FOOT SATELLITE ANTENNA



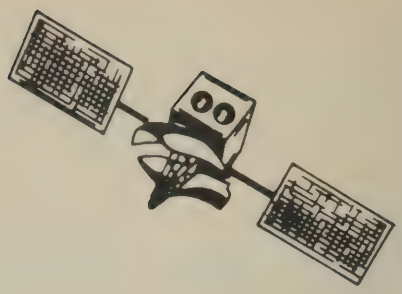
FEATURING

***EXTRA MARGIN of performance over 10' parabolics**
***EASILY SHIPPED and fast, precision assembly and set-up**
***QUALITY aluminum construction, fast delivery to you**
***CHOICE of mounting options**
***WRITE for full details on this exciting new field-proven satellite antenna!**

ANTENNA DEVELOPMENT AND MANUFACTURING, INC.
2745 Bedoll Av., P. O. Box 1178, Poplar Bluff, Mo. 63901

Telephone (314)785-5988

SPTS '80



MIAMI, FLORIDA

FEBRUARY 5, 6, 7

MIAMI'S BAYFRONT PARK AUDITORIUM

THE BIG EVENT! Following the same highly informative and successful format of SPTS '79, Bob Cooper opens the 1980 Satellite TV season with SPTS '80 February 5, 6 and 7 at the Bayfront Park Auditorium in Miami, Florida. Three big days of technical lectures, marketing sessions, exhibits and live satellite demonstrations all designed to bring you up to date on the fastest emerging new television technology of our time!

THE EMPHASIS IS EVERYWHERE! For the technology buff, Stanford's Taylor Howard and Robert Coleman of South Carolina have merged their talents to create a **new** single conversion super receiver for the 80's! Active GaAs-FET technology front end and mixer, combined with a new Howard-Coleman solid state 70 MHz i.f. and demodulator circuit will be shown for the first time at SPTS '80 in Miami. A truly simple, high performance receiver! **For the business person**, numerous panels dealing with the newest in commercial hardware, receive system marketing experience and the impact of the FCC's deregulation of licensing. For the system designer and engineer, 12 (twelve) H. Paul Shuch 'TVRO Symposium' sessions designed to teach you 4 GHz technology from the sky down!

FOR EVERYONE - exhibits, operating satellite terminals, satellite system videotapes and plenty of literature and hard to find satellite TV data. **FOR CARIBBEAN, CENTRAL AND SOUTH AMERICAN RESIDENTS** - two special sessions (in Spanish) detailing the reception conditions and requirements in that area of the world. **PRE-REGISTRATION IS MANDATORY!** Every indication is that this 1,000 seat auditorium will be filled to capacity with pre-registrants by the middle of January. To be sure of getting into SPTS '80/Miami, send off your registration application today. Full hotel/motel registration data will be sent to you with your confirmation.

___ **$150 PER REGISTRANT ENCLOSED.** Please rush our confirmation and the information regarding hotels and motels.

My Name _____

Company (if applicable) _____

Address _____

City _____

Enclose full payment in U.S. funds for all registrants and mail to:

STPS '80/Miami
P.O. Box G
Arcadia, OK 73007
(U.S.A.)

SPTS '80
Is A Production Of
Bob Cooper's
SATELLITE
TELEVISION
TECHNOLOGY

INSIDE THIS ISSUE

Can't Beat 'Em? Join Them!
BASICS OF A CATV SYSTEM

What's It About?
THE SPACECOAST 'KIT'

Boy-Are They Confused!
FCC DEREGULATION / PHASE 2

It's Almost Here
SPTS '80 MIAMI UPDATE

COOP'S SATELLITE DIGEST

JANUARY 1980

PARAFRAME

MOST-ADMIRED AT SPTS '79 was the PARAFRAME ET/3.66 (12-foot) TVRO antenna. Those who saw us go "cherry-picking" on Day Two won't soon forget the fine reception we got from ANIK-B, while using a 150°K LNA. That's big performance and if you were there YOU SAW IT! For reception photos and product information, write or phone "Mr. Paraframe," Jim Vines.

Paraframe, Inc.
1000 Sunset Drive West
P. O. Box 423
Monee, Illinois 60449

Phone 312/534-7435

COOP'S COMMENT ON TECHNOLOGY

AFTER WARC

The World Administrative Radio Conference (WARC) is over. Fortunately they don't happen very often; there were times during the just finished event that many nations felt there might never be another one.

During WARC nations meet in a mini-U.N. type setting and attempt to work out how the full radio spectrum (from DC to daylight as it were) will be partitioned up and utilized for the next say twenty years. Each nation has one vote and WARC breaks various frequency segments (such as 3-30 MHz, etc.) into working groups where smaller committees attempt to work out the game plan for that frequency region. There are also working groups divided by use or user definition; groups that spend time debating what allocations will be assigned to international (shortwave) broadcasting, satellite and so on. Approximately 150 nations were represented and for about half this was their first such conference. Their "nations" did not exist when the last WARC was held.

The U.S. learned a difficult lesson at this WARC. We only count for a single vote. We also learned that unlike past WARCs where most of the meaty issues were resolved during the conference proper, this time around many of the tough issues are going to continue unresolved for perhaps a decade or more. Satellite assignments and satellite policy is one of those areas.

As far as the U.S. is concerned, WARC resolved very little in the satellite area. We either lost on every significant position we backed or in the best case we saw the issues left unresolved when WARC adjourned. There will be a number of significant post-WARC gatherings during the 1980's and as a nation we'll have a few years to get our act back together.

Going into WARC the U.S. and Canada were at opposite ends of a battle over how the 11/12 GHz band would be utilized. The Canadians wanted the orbit arc carved up in a hybrid way allowing 11/12 GHz satellites in geostationary orbit to broadcast (as in direct to home) or be 'fixed' (as in point to point common carrier). The U.S. wanted the 11/12 GHz band broken up so that satellites operating could do both at once; using **part** of the 11/12 GHz downlink band for 'broadcasting' and **part** for 'fixed'. In the final analysis neither side really won.

As it turned out the third world countries won; they want the U.S. and other satellite powers to stop using the geostationary orbit as if it belonged to them. And to not be launching future satellites without international approval on a satellite by satellite basis. The U.S. had years ago won the right to authorize its own satellites within the previously approved North American domestic satellite orbit arc (70 degrees west to 140 degrees west). If the U.S. abides by the 1979 decisions of WARC, and those yet to come in 1983, and, 1984/1986 (when a two stage space planning conference takes up where WARC left off), there will be many more constraints on orbit parking spots in the future. At not only 4 GHz but 11/12 GHz as well.

Digesting the WARC decisions is a massive task. We feel our readers are not interested in the games nations play but only the hard facts. We'll have a condensed report as the decisions impact on satellite development world wide in the February **CSD**. For now these brief highlights will tide you over:

1) WARC decided that 12.3 to 12.7 GHz will be set aside worldwide for 'direct broadcasting satellites'. If we continue to eat up 80 MHz bandwidth per transponder (as has been our habit with CTS and ANIK) that's room for five channels. On the dark side the U.S. officials are dubious that after 1984/86 the U.S. will have more than 4 orbit spots (one per time zone); maybe fewer.
2) Worldwide the 3.4 to 3.6 GHz band will be added to the 'fixed' service assignment. Except in North America where the U.S. Airforce AWACS military radar system uses this band.

If nothing more definite than the 12.3 to 12.7 allocation was decided in the 'direct to home broadcasting' area, that alone at least gives equipment designers the opportunity to zero in on the place in the spectrum where their hardware is going to have to perform. The U.S. delegation meanwhile suggested that "it will be ten years...perhaps longer, before that service is operational in the U.S.". Why? Because first Congress must amend the Communications Act to permit direct satellite broadcasting, then the 1983 western hemisphere regional planning meeting has to decide how many (and where) 12 GHz direct broadcasting slots the U.S. will get, and finally, some system for owning and operating the satellites has to be advanced, and approved.

Where does this leave us? With an in-place and operational 4 GHz 'fixed' service that will be with us in its present form for perhaps a decade. Politics, national and international, will keep us at 4 GHz long after the rest of the world has moved into 12 GHz. Like it or not, 4 GHz is our home for awhile so we might as well get used to it!

FRONT COVER/JANUARY

Microwave General's home terminal demonstration unit operating in downtown San Francisco at the WESCON show this past fall. That's Chuck Colby, MG's Chairman of the Board in the tan suit. Terminal employs MG's 10 foot antenna, International Crystal TV-4200 receiver and an Avantek 120 K LNA. **What a way to attract a crowd!**

CSD TECHNOLOGY

COOP'S SATELLITE DIGEST (Technology Edition) is produced monthly by Satellite Television Technology, P.O. Box G, Arcadia, Oklahoma 73007 (405-396-2574). CSD is available in two separate editions (Technology and Programming) or as a combined subscription. Subscription rates are $30 per year for first class mail delivery within U.S.A. or Canada for either edition, or $50 per year for the combined editions. Outside U.S.A. add $25.00 per year for any subscription. All subscriptions to be paid in advance in U.S. funds drawn on a U.S. bank; no invoicing. Contents are copyright 1980 © by Satellite Television Technology and any duplication or reproduction in any form without written permission is a violation of Federal Statue (17 USC 101 et seq.).

TECHNICAL BASICS CATV SYSTEM DESIGN

ONCE ON THE GROUND...

As more and more individuals complete their private (home) TVRO receiving terminals and start producing quality pictures with their own effort and invested capital, the interest in the **system** begins to expand. One direction many private TVRO terminal operators are exploring is re-distribution of the satellite signal(s) via a privately owned coaxial cable distribution network.

The cable distribution technology (CATV for short) is as mature as the satellite (TVRO) technology is emerging. Very little of a new and revolutionary nature has really happened in the CATV field in the past five to seven years. New advances in technology have largely been geared to improved reliability, and towards reducing (or maintaining in inflationary times) the price of hardware readily available for the tasks at hand.

There are several key areas of discussion for anyone contemplating sharing his private TVRO terminal with one or more additional residences. In a companion feature appearing in this month's **CSD Programming Section** we look at some of the more important aspects of the 'legal requirements' in cable system operation. Any student of the technology involved in cable must be prepared to also become a legal student of the FCC (and state and local) laws and rules in this area since at best they are confusing and often conflicting.

Legally, there are **two** national entities involved in cable system operation that we need to concern ourselves with. We repeat this statement in the companion Programming Section feature because it is important. The FCC has a complex set of rules governing cable system operation. This one you expect. However, a lesser known entity into cable operations is the Office of Copyrights. FCC rules define a cable system as any coaxial distribution system carrying off-air television broadcast signals to 50 or more homes. Below 50 homes, the FCC does not consider you to be a CATV system. The Copyright folks, on the other hand, are not as lenient. Any system that connects to **two or more** separate residences or non-commonly owned and operated buildings is by Copyright definition a cable TV system'. A more detailed discussion of what this means follows in the Programming Section.

Technically, a small cable television is no longer a complicated electronic animal. **See diagram one**. Cable system design revolves around a few easy to understand principles:

1)Everything starts off in the system at the 'headend'. In cable language, this is where the off-air, cable, locally generated and other signals originate their in-cable trip.

2)The system design is predicated on two factors: each television receiver interconnected to the coaxial network is supposed to receive some minimum level of television signal, and, the total system is a fairly delicate balance between (known) cable attenuation characteristics and (known) cable-repeater amplifier gain parameters.

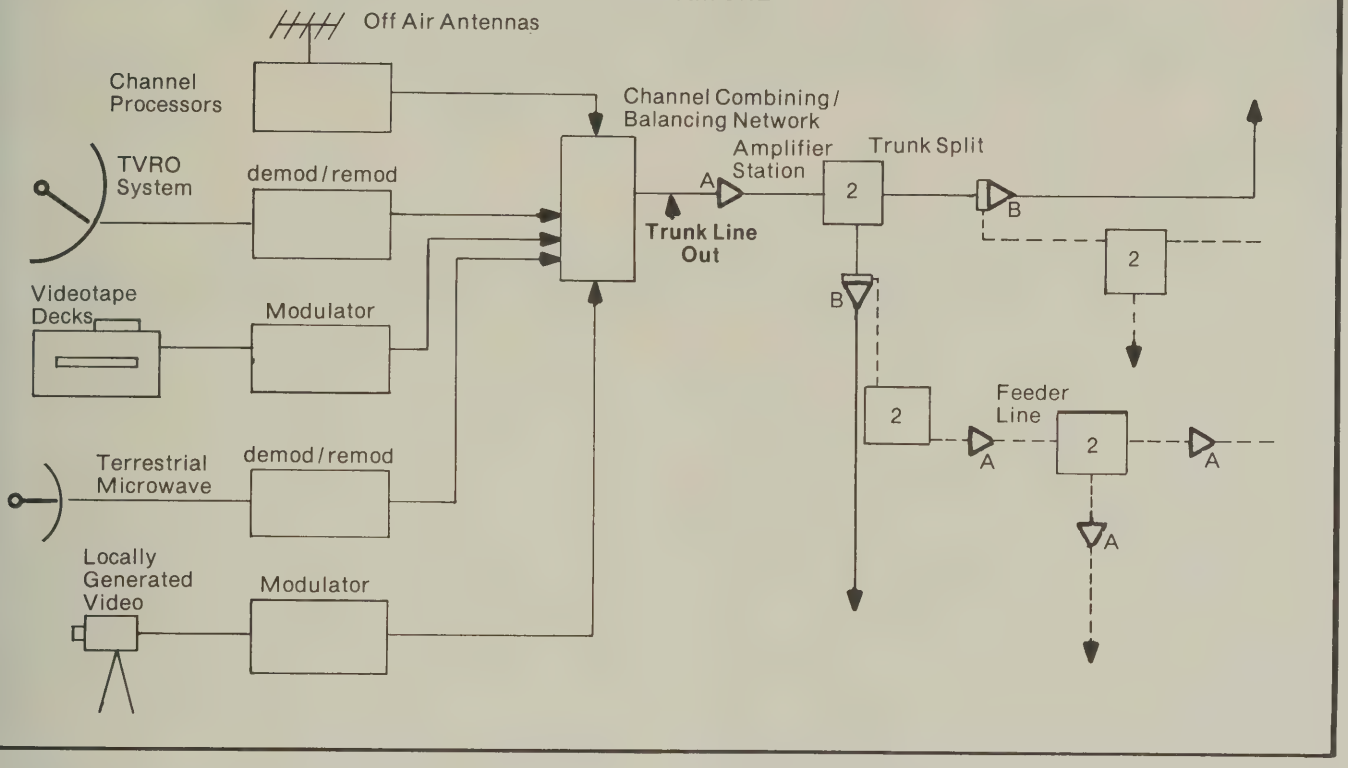
The FCC suggests that all television receivers interconnected shall receive a minimum signal level of 0 dBmV (1,000 microvolts) as measured across 75 ohms, on the weakest (or lowest level) channel carried by the cable system. At the same time the FCC says that the maximum signal level for the strongest signal delivered shall not be more than + 12 dBmV (4,000 microvolts), and, that any two immediately adjacent signals (such as channels 2 and 3) shall not be more than 3 dB apart in signal level as measured at the subscriber receiver. As you might suspect, the cable industry measures RF signal levels with an RF type voltmeter, frequency selective, known generally as an FSM (field strength meter) or SLM (signal level meter). A typical measurement unit has a calibrated (+ /- 1.5 dB accuracy nominal) meter scale, a tuning control that allows the user to dial up the respective visual and audio carriers for each TV channel, and a selection of attenuator pads (calibrated) with which he can adjust the 'range' of measurements (not unlike one has with a VOM). Prices range from $150 for simplistic meters with limited 'ranges' (intended for people who install cable at homes and where the variation range in signal levels is small) to $1,500 machines that include built in spectrum analysis options.

DIAGRAM ONE

The headend can be designed to combine numerous different RF carrier frequencies onto the distribution coaxial cable.These RF carriers can be exactly as taken off the air with locally installed receiving antennas [although they must be amplified, in some cases 'filtered' and in all cases level—adjusted to suit the design requirements of the cable system], or, they can be satellite signals received at 4 GHz, demodulated to baseband, and then re—modulated again back to a desired RF carrier frequency with the aid of a **'TV** modulator'. Or, the cable distributed signals starting at the headend can be locally originated either with live studio equipment or from videotape decks, in both cases the baseband video [and audio] is plugged into a TV modulator which places the baseband signals into the system on a chosen RF carrier frequency.

Whatever the source of the programming material [and there are other possibilities such as terrestrial microwave delivered signals, computer generated video displays of news and weather, etc.] it all flows into the headend for

DIAGRAM ONE



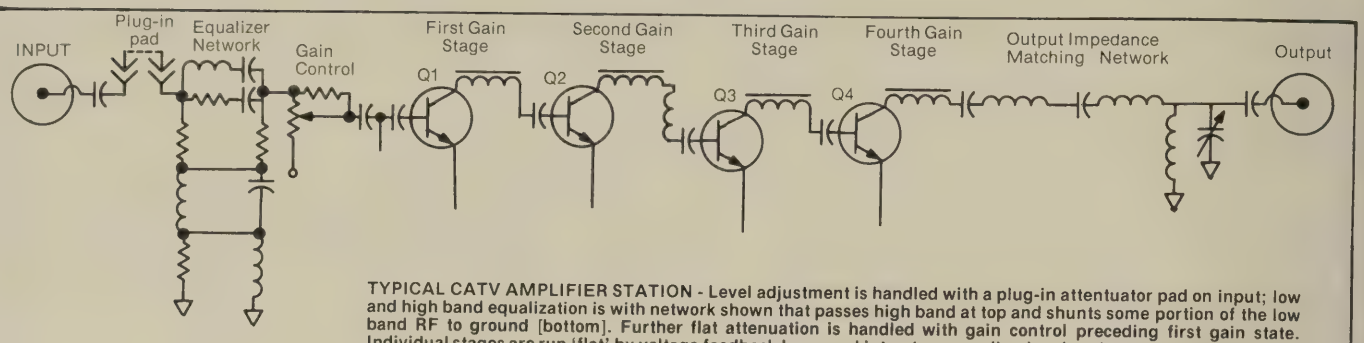
'shaping', balance and mixing.

The cable engineer looks at his channel spectrum to be carried and he looks at the **loss**(or attenuation) characteristics of his coaxial cable leaving the headend. Since loss is directly related to frequency, coaxial cable (of any type) loses voltage level (i.e. signals get weaker) faster at the higher frequencies (such as TV channel 13 or 211.25 to 215.75 MHz)than say at channel 2 (55.25 to 59.75 MHz). A cable system designer thinks in terms of 'balance'; he wants to design the system with as few active parts (i.e. amplifier stations) as possible while at the same time maintaining as high a signal to noise (and signal to interference) ratio as possible. Knowing the loss of the coaxial cable at all cable — carriage frequencies, he can can compute how many feet he can go **between** the **headend** and the **first** amplifier station by simply knowing what the minimum recommended input (RF signal voltage) level is for his first amplifier station. Each foot of cable adds loss; more loss at higher frequencies than at lower frequencier. Each amplifier station has a noise figure (specifed by the manufacturer) and if you wish to maintain a reasonably high signal to noise ratio through the system, you compute the location of each amplifier by simply plugging it into the coaxial distribution system at a point along the cable where the cable attenuation has reduced the RF voltage levels present to the level designated as the 'minimum input level' (for a specified signal to noise ratio; a function of the amplifier station's noise figure).

Working backwards, if cable loss per foot is known (for each frequency of interest), and the minimum input level for an amplifier station is also known, there is one more variable missing; the maximum output capability for the headend equipment. Most commercial headend equipment is capable of RF output levels in the +40 to +65 dBmV (100,000 microvolts or 0.1 volts to 1,800,000 microvolts; or 1.8 volts). The whole cable world functions in the dBmV language where 0 dBmV is equal to 1,000 microvolts. Yes, there are both — dBmVs and + dBmVs.

Selection of the distribution cable type is important since some cables (because of their electrical properties or size; measured always by the cable's diameter) have less loss than other cables. Obviously less loss per foot is desireable since this translates to greater distances between the headend and the first amplifier, and between subsequent amplifiers. By and large you get less loss only with larger cable diameters; the same principle that holds for your TVRO coaxial cable run. Larger cables also (as you would suspect) cost more money and there is a trade off here between using larger cables and fewer amplifiers or smaller cables and more amplifiers. In very large cable systems (with hundreds of miles of cable plant and dozens of amplifer stations in 'cascade')there are also electrical limits to the quality of the signal to noise (and signal to amplifier generated interference) one finds at the 'end' fo such large plants. So in very complex cable plants there is often a 'quality consideration' that enters the equation for cable selection; if changing from a particular small type of cable for the system to a larger type of cable will reduce the total number of amplifier stations that will be in 'cascade' (or series) along the longest leg of the plant from say 64 to 32 amplifiers, this is often the choice of the designer since he knows that each time he **doubles** the number of amplifiers in cascade he reduces the signal to (amplifier generated) interference ratio by 3 dB.

These are nice things to know but for most designers of relatively small cable distribution plants such problems are more academic than real world. The cable amplifier stations have a **minimum input level** (to maintain a desired signal to noise ratio), a **maximum gain** (determined by the number of stages within the amplifier) and a **maximum output capability** (determined by the rating of the output stage—in a single ended amplifier design, or output stages—in a push—pull output design). Minimum input levels have been discussed and should be readily understood by most TVRO builders. The principle is the same as with LNA noise figures; too much amplifier noise degrades the signal to noise ratio and to maintain a high signal to noise ratio the input signal must be jacked upwards when the noise figure or temperature is by design quite high. A typical CATV amplifier station has a noise figure in the 9—11 dB region. Yes, this is very high by modern VHF techniques but this noise figure has to be achieved across a relatively wide spectrum (typically 50 to 300 MHz in a modern cable amplifier) and this 2.5 octave frequency span presents some tough problems for low noise design. A microwave



TYPICAL CATV AMPLIFIER STATION - Level adjustment is handled with a plug-in attentuator pad on input; low and high band equalization is with network shown that passes high band at top and shunts some portion of the low band RF to ground [bottom]. Further flat attenuation is handled with gain control preceding first gain state. Individual stages are run 'flat' by voltage feedback loops and interstage coupling involves impedance transformers between stages.

comparison would be achieving the LNA noise figure you now have with an amplifier not 500 MHz wide (3.7 to 4.2 GHz) but rather 18.5 GHz wide (3.7 to 22.2 GHz or 2.5 octaves). In that perspective, it is (or would be) a tough assignment!

Maximum gain is limited by the output capability of the device (or devices) in the output stage, and internal feedback problems. CATV amplifiers are weather sealed because they hang out their 18 feet (or more) above ground in a hostile environment; or they are spotted in equipment enclosures just above the ground in 'underground' CATV systems. This weather tight enclosure is a feedback loop just waiting to start oscillating. To cram too much gain into the weather (and RF tight—by FCC decree) housing is to beg that some of the (amplified) output voltage find its way back into the (weaker) input circuits. RF feedback with video modulated carriers is an experience you don't want to have! So typically between 22 and 30 dB of gain is about all one finds inside the amplifier housing.

Maximum output capability is a function of the device(s) chosen for the output stage(s). Any amplification device will start distorting when the sum of its input signal plus its own gain exceeds the RF output level the device is rated to handle. All CATV amplifiers are linear; the operate in a mode that is designed to insure that the RF waveforms that enter the stage or amplifier station come out of the stage or amplifier stages looking just like they went in; only stronger. Any device that operates in a linear mode has a relatively low efficency level and an output capability that is substantially reduced from the output capability of the same device operating in a non—linear (such as Class C) mode.

DIAGRAM TWO

There are two types of loss of interest to the cable system designer; 'flat' loss, and 'tilted' loss. Flat loss means that the (RF) voltage present drops equally without regard to frequency. Channel two and 13 drop at the same point by the same amount. You get flat loss when you 'split' the signal present into two or more segments. 'Tilted' loss (or slope as it is sometimes mis—named) is a function of the coaxial cable's attenuation characteristics. If the loss per 100 feet is 0.78 dB at channel 2 (55.25 MHz) and 1.62 dB per 100 feet at channel 13 (211.25 MHz), the system designer has to plan that his channel 13 signal is going to end up going onward 0.84 dB weaker (per 100 feet) at 13 than at 2.

You create split loss by reaching a street corner and having to halve or third or quarter the signal coming from the headend into two or three or four parts. You do this with a 'signal splitter' (two—way, three—way, etc.). A signal splitter intended for outdoor (i.e. hung up on the line) use is weather tight and of 'hybrid' design. Hybrid design in this application simply means there is isolation between any two of the output ports such that the loss **between** two **output** ports is purposefully high to insure that there is no interaction (or RF feedback paths) between 'legs' of the line. In **theory** when you split a signal into halves, you lose 3 dB of (flat) signal voltage. In **practice** you actually lose more like 3.75 dB or a tad more. Into quarters you lose 6 dB in theory and typically 7 dB in practice.

'Tilted' loss just occurs all by itself as the signals (on different RF carrier frequencies) wind their way down the cable.

Now, if you know the cable's 'sloped—loss' (i.e. the loss at the lowest channel and the loss at the highest channel), per cable foot or per cable hundred feed, and you know the output capability of the amplifier station as well as the minimum recommended input signal level of the next amplifier station, you are part way home to determining where the next amplifier should be inserted into the line. To this you must also **add** whatever flat loss there may be along the way due to line splitters.

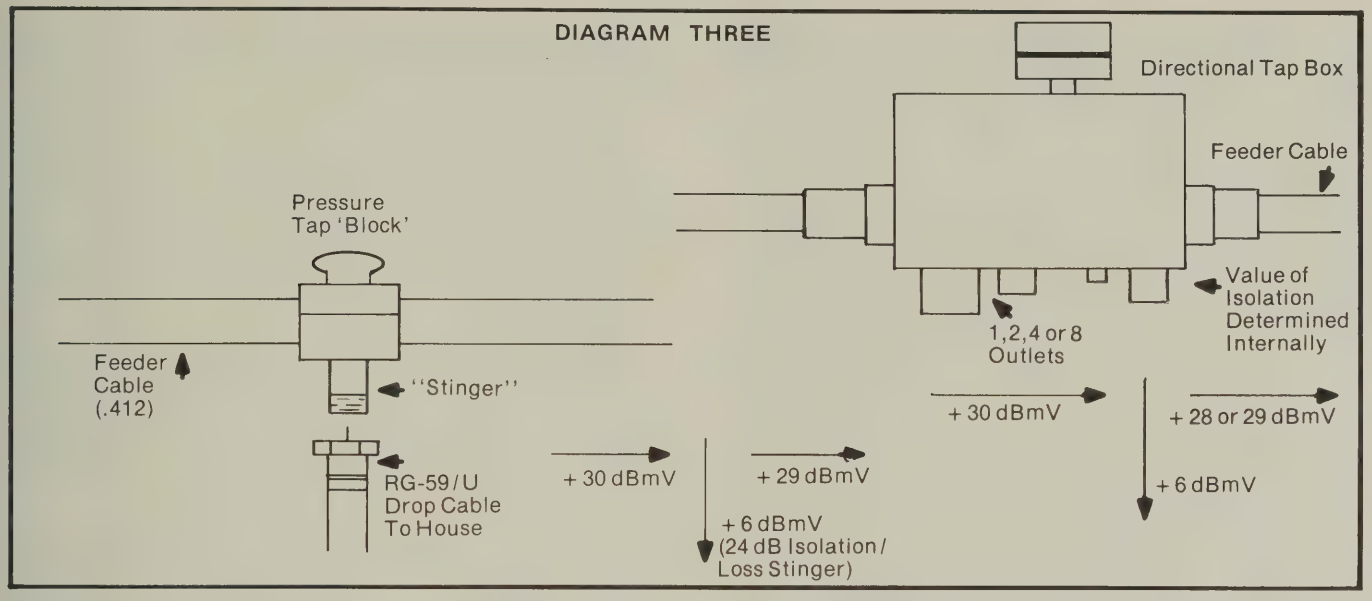
If channel 13 loses level faster than channel 2, seemingly you would have the option of:

1) Operating the amplifier station in a 'tilted' **output** condition where the output level on channel 2 is reduced from channel 13, so that the next amplifier receives a 'flat' (i.e. same level across the band) input at its minimum recommended level, or,
2) Operating the amplifier station in a 'flat' **output** condition where the output is flat across the band but the next amplifier **input** circuit has a tilted RF voltage level condition.

Both methods have been in practice; only one prevails in a modern system. If the output stages operate 'flat' you ease up the design parameters considerably (remember these are linear operated stages). But if this also means that you operate the input to the next amplifier tilted (i.e. 13 higher than 2) and crank down the lower end channels with a form of frequency selective attenuator. This raises the noise figure on the amplifier's input circuit which is basically bad news since noise tends to add through a cascaded system.

In a modern system **the input is run flat** and the **output is run tilted**; although the actual tilt usually takes place electronically in an intermediate stage. Let's say the input is +10 dBmV and the output calls for +36 dBmV on channel 13 and +28 dBmV on channel two (with a linear slope between the two extremes). This says the amplifier station must contribute 26 dB of gain (+36 dBmV output minus +10 dBmv input) on channel 13 and 18 dB of gain (+28 dBmV output minus +10 dBmV input) on channel 2. If the 'tilt' is built in (with variable controls) on a 'buffer' stage located between the first amplifier (input) and the last amplifier(s) (output), we have a bit of the best of both worlds. Not all amplifiers work this way; some simply place a 'tilt control' network (pot operating across a varactor diode tuned input circuit) on the input and let it go at that. Since the additional (tilt) loss is always added at the low end of the spectrum (i.e. channel 2 up) there is some wisdom in this approach; the noise figure of the amplifier is apt to be naturally lower and less critical at the low end of the spectrum than at the higher end (channel 13 down). If only a few amplifiers are going to operate in cascade, you can usually get by with this less expensive approach to system 'balance'.

This might be a good point to note that CATV amplifiers are (coaxial) line voltage fed; 30 or 60 VAC (not DC) is duplexed onto the coaxial cable through isolation-rated step down transformer power supplies that turn the normal 120 VAC into



this line-carriage voltage. Within the amplifier stations ½ or full wave rectifier circuits turn the AC into DC (typically in the 18 to 28 volt DC region) to operate the line amplifiers. A typical amplifier station can draw anyplace from 150 mA to 500 mA depending upon the amount of support electronics inside the casing. Why not DC powering? Well, way back in 1963 when transistorized (i.e. solid state) line amplifier stations began to appear DC powering was tried. But unfortunately the cable fittings of that era were anything but moisture tight and moisture leaked into the fittings. Moisture **plus** dis-similar metals **plus** an often healthy amount of DC current flowing added up to terrible cases of electrolysis. Sort of like the gunk you see on your battery terminals after a long hard winter with the family vehicle. RF didn't like this gunk and the cable industry bailed out of DC and switched to AC in a hurry. And with a few exceptions, they've stayed that way ever since.

DIAGRAM THREE

The modern cable system typically has two types of 'lines' running. The master line is called a truck line. That means it is sacred, pure of contamination, designed to inter-connect portions of town with the headend. Customer homes are **not** connected to the trunk line except in rare cases. The best quality amplifiers (i.e. most gain, lowest noise figures, highest signal to noise operation) are found on the trunk. The 'trunk' theory is sort of like the investment plan that calls for you to live only off the interest of your savings, not your principal.

The other line category is the 'distribution' or 'feeder' line. This is where you find the customers hooked up. There are two common ways to extract a prescribed amount of signal out of the feeder line and coax (pun intended) it into the house. Years ago the cable industry utilized a device known as a 'pressure tap'. This was (and still is since many smaller systems still use them) an attachment that connects to the feeder cable by taking a small tool (called a 'coring tool') and drilling or coring a small hole through the cable's outer shield (typically a solid aluminum jacket these days), on through the poly insulation and up to (but not through) the copper or copper-coated/clad-center conductor. Then a 'block' attachment is fitted over the hole grasping the line and aligning with the cored hole. Into the cored hole a 'stinger' is inserted (by screwing into threads on the attachment device). The 'stinger' may have a capacitive or a resistive element inside and the value of the capacitor or resistor determines how much RF signal voltage is 'tapped' out of the feeder line. A piece of smaller (flexible) cable such as RG-59/U (or RG-11/U if the run is quite long) then carries the cable signals on into the residence.

A more modern approach to extracting a prescribed amount of signal out of the feeder line is the 'directional tap'. This is a hybrid network that inserts into the line by breaking the line and inserting both ends of the break into special captive fittings machined onto the ends of the directional tap. The directional tap provides high isolation between the customer's line and the feeder line, as well as high isolation between other sets on the line even if they 'come off of' the same directional tap.

Both pressure tap 'stingers' and directional taps are available in many values of 'loss' or isolation. That means that the system designer selects a 'value' for a location based upon the amount (level) of RF energy present at that point on the feeder line. Obviously if the customer is to be hooked to the line shortly after an amplifier station the RF voltage levels are quite high (because cable or split loss has not taken it's toll yet) whereas another customer connected down the 'span' just ahead of the next amplifier station has to get his signal from a line that is approaching the minimum RF level found on the line; established by the input level recommended for the amplifier station. Not all stinger or directional taps have the same amount of 'through loss'; which is the loss created by the tap being placed on the line. A tap located immediately after an amplifier needs only a small percentage of the total signal available while a tap located closer to an input of an amplifier needs a larger percentage of the total RF voltage level present. Tap 'values' are measured in terms of the dB of 'loss' or isolation. For example, a "25 dB tap" extracts a signal level from the feeder line that is 25 dB **below** the line level at that point. Again, this 'loss' is built into the tap by design using the proper value or combination of values for the network, or the resistors and capacitors in the actual circuit of the tap.

And this would be a good point to note that the AC amplifier voltage present on the line is not allowed onto the customer's "drop line" because to do so might cause damage to the TV receiver connected on the opposite end. A simple AC blocking capacitor keeps the AC on its own side of the tap.

If the system designer knows the line level that will be present at a location (because of his initial plant design and amplifier placement, plus the known cable losses up to that point from the last amplifier), and he knows "approximately" how far he will run his "drop cable" (as well as the loss per foot/hundred feet of the drop cable), he can then select the "value" of the tap for that location. Of course he also knows that his signal must not be lower than 0 dBmV (1,000 microvolts) when it reaches the customer's TV set antenna terminals.

And if the customer has two sets in his home? A lower cost splitter, still typically hybrid (high isolation) but housed in a non-weather tight container mounts at the house end and the drop cable plugs into that splitter, and then takes off in two separate directions to the two receivers. To compensate for the

extra loss of the house-installed splitter, the system designer will drop his tap value by 3.7 (4) dB at that house location so that he ends up still with the proper amount of signal at each of the two receivers (i.e. he **leaves** the line with an extra 4 dB of signal).

Let's review the basics and then look at a more realistic simple system.

1)Everything starts at the headend. The channels to be carried are created or received off air, and they leave the headend at some RF voltage level that is some compromise between the maximum output capability of the headend pieces and the cable loss to the next (first) amplifier station. Remember we want to arrive at the first amplifier with a 'flat' input that is within the range of the 'minimum recommended input level'. This typically means that higher frequency channels run out of the headend 'hotter' than lower frequency channels since the cable attenuation increases with frequency.

2)If you use large diameter cable you can go further without introducing an amplifier station, but larger diameter cable costs as much as three times as much as the common garden variety (0).412 cable (largely utilized in feeder lines). When you must have an amplifier, it is coaxial line powered (typically) with an AC voltage of either 30 or 60 volts. Actual amplifier operation is by DC however through a rectifier circuit built into the amplifier.

3)Line losses are tilted with lower losses at lower frequencies; split losses are flat affecting all frequencies by the same amount. Both types of losses must be included in calculations to determine where line amplifier stations are to be located.

4)Customers are fed signals through tap-off devices that have adjustable amounts of 'isolation' (or loss). You select the tap off for each location by determining how much line signal voltage is present in front of the house, how much more signal you will lose in the drop run into the house, and then working with the minimum prescribed level to the set of 0 dBmV you select the appropriate tap value.

CONNECTING UP FOUR HOMES

All of the preceding may be academic to you; all you want to do is to start off by connecting up a few neighbors to a single channel of satellite reception. You've worked out a sharing arrangement whereby they agree to watch what you want to watch (that may be some trick) and now you need to know how to get that single channel into their TV set.

Let's look first at your 'headend'. If you are utilizing a typical LM 1889 RF re—modulator (see **Howard Terminal Manual**,etc.) on channel 3,4 or 5, what type of RF level is coming out of it? Typically between +6 and +10 dBmv (2,000 to 3,100 microvolts). What about the "RF output" for a typical VTR modulator? The same; not to exceed +10 dBmV. Humm. Not a lot of signal here.

Now let's look at some typical cable that is cheap; say RG—59/U. It has 3 (.08) dB of loss at channel 3 (3.24 at channel 4) per 100 feet according to the manufacturer. That says that if you connect up 200 feet of the stuff at channel 4 you will have 6.5 dB of loss at the end of the run. If you started out with an even +6 dBmV from your modulator, you are now —0.5 dBmV (950 microvolts). Close enough to 0 dBmV that you would never 'see' the difference but not enough signal left to feed more than single receiver.

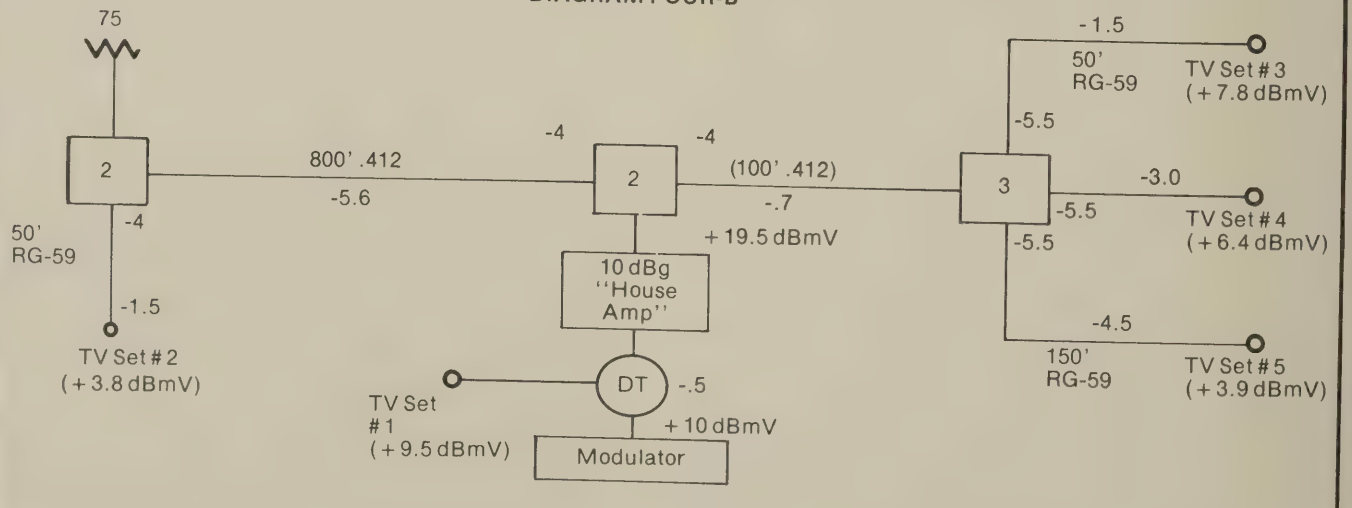
(You can and should measure the actual RF output level of your modulator although purchasing even a $150 CATV—/MATV installer's meter for this occasional or one time measurement seems a waste of money. So ask around and borrow one from a local CATV type or a TV antenna installation shop.You are going to have to know what your modulator puts out to properly calculate any type of distribution system.)

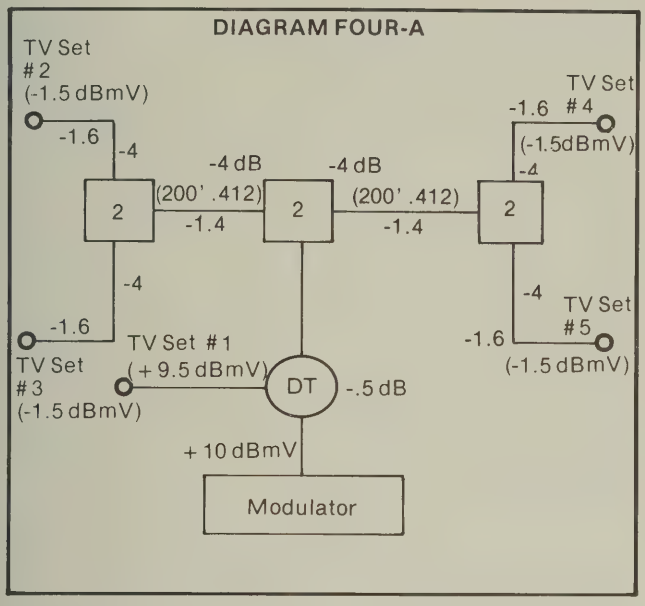
So let's look at **diagram four**. There are actually two diagrams here. In diagram four-A we have substituted (0).412 aluminum jacketed CATV feeder cable for our RG-59/U example and we've raised the output level from your modulator to +10 dBmV. We have 200 feet of .412 going in two directions after coming out of the modulator directly into a two-way hybrid splitter. At the end of 200 feet of .412 we have another two-way hybrid splitter. This gives us two house feeds off of each end of the .412 and from that hybrid splitter we run 50 feet of RG-59/U on to the TV sets. The total loss is 11.5 dB between the +10 dBmV output modulator and the input terminals on each of the four sets. We fed our own set by inserting a directional tap between the modulator output and the input to the first hybrid two-way splitter and that cost us 0.5 dB of loss. No amplifier, five sets connected and we only began with +10 dBmV.

In **diagram four-B** we have a more complex problem. One of our sets is 800 feet away from your 'headend' and the other three are in the opposite direction but quite close by. We would like to get by without any expensive CATV line amplifiers. And yet we don't want the long-distance set to suffer with a degraded signal.

We come out of the modulator through a directional tap with 0.5 dB of through loss for our local in-house outlet, and then into a 10 dB gain low-cost MATV type 110 VAC operated amplifier. Such amplifiers are typically available through Radio Shack, your local Finco or Channel Master wholesaler and often they are designed so that you have the **option** of

DIAGRAM FOUR-B





either using them as four outlet 'distribution amplifiers' (for an in-house system with separate lines to four rooms) in which case you get 0 to 2 dB **gain per outlet**, to +10 dB of gain if you only elect to use a **a single outlet.** We'll just use one outlet on this under $30 amplifier (with built in power supply). The ouput is fed to a two—way bybrid splitter that divides the signal into a pair of 'feeders'; one to the left runs 800 feet terminating in a 2—way hybrid splitter and the right leg running 100 feet and then dividing in a three—way hybrid. Note the left hand leg could have been run all of the way to the lone TV set. So why 'throw away' 4 dB of (split loss) signal? Two reasons; a hybrid splitter provides the 'system' with some isolation between the lone TV set fed on the left hand leg and balance of the system. Isolation is simply insuring that local oscillator radiation, tuner mis—match, etc. on this TV set does not feed back into the system to cause ghosting and crud on the other sets on the system. And since our feeder line chosen here is .412 cable, it is usually simpler to run the smaller (and more flexible) RG—59/U cable to the TV set inside the house than it would be to run the .412 inside the house. Note that the un—used port on the two—way hybrid on the left is terminated; a 75 ohm resistor connects from the center pin to ground on the vacant port. On the right hand leg the two—way drives 100 feet of .412 cable, and the three—way hybrid. Between the three—way and the three homes connected there are various lengths of RG—59/U up to 150 feet.

FINDING PARTS

CATV and MATV parts are not difficult to locate. Several nationally distributed suppliers have extensive lines of splitters, in—house amplifiers, and fittings; including Finco, Winegard, Channel Master, Jerrold and Blonder Tongue. Wholesale electronic firms in your locale probably carry one or more of these 'brand' names. Aluminum jacketed (CATV) type cable is seldom distributed by wholesale electronic houses but it turns out that area CATV firms usually have dozens of 'tag ends' left over during their initial construction phase. Tag ends are short pieces usually under a few hundred feet long which if used by the cable company would require that they 'splice' the lines at an awkward spot (such as between poles or 'mid—span' as it is known). CATV firms pay around 7 to 9 cents a foot for .412 cable in large lots and if you offer to take some tag ends off their hands for that price range you should strike a deal. Connectors for .412 cable will have to be bought from the CATV company, through a sophisticated distributor of CATV hardware or through a firm such as DAVCO (P.O. Box 861 Batesville, Ark. 72501; 501—793—3816). DAVCO, incidentially, has an excellent selection of all of the parts you will need for virtually any size MATV/CATV distribution system and they have been dealing in mail order hardware for nearly 30 years.

Most of the name brand suppliers have 'MATV/CATV system design handbooks' available, either as free handouts or very reasonably priced. Ask your distributor to obtain one for you since it will save you hours in figuring out how to plug the parts together on paper before you start construction.

CAVETS

A coaxial cable system is a secure, non—radiating RF distribution technique. You want to be sure in installing it that you don't accidentially radiate signal! If you utilize shielded cable, terminate un—used (splitter) outputs and do not use any (non—shielded) flat or twin line anyplace, you'll be OK. Your system should avoid using an RF carrier distribution channel (frequency) **in use in your area.** If channel 4 is in use locally, use channel 3 for your TVRO signal re—distribution. If you can **disconnect** your regular TV antenna feedline (and antenna) from the 300 ohm terminals on the back of your set and **still see pictures** and hear sound on the TV set, that means the local signal on the channel is powerful enough to cause interference to your TVRO signal on the **same channel** (the wiring internal to the TV set is picking up the 'direct' local signal).

And, make sure that you don't parallel the TVRO feedline signal and your local TV antenna signal to the antenna terminals on the back of the TV set as this will cause the TVRO fed signal to couple back **up** your TV antenna transmission line and radiate through your TV antenna to the neighborhood! Install a switch to select between 'local' and 'TVRO'.

In a future issue of **CSD** we'll look at a more complex approach to the re—distribution system design where local off—air signals and the TVRO signal are 'married' at your headend into a single 75 ohm distribution cable.

BENCHMARK dBmV / Microvolt Levels

dBmV	Microvolts	dBmV	Microvolts
-40	10	+15	5,600
-30	32	+20	10,000
-20	100	+25	18,000
10	320	+30	32,000
5	560	+35	56,000
-4	630	+40	100,000
-3	700	+45	180,000
-2	800	+50	320,000
-1	900	+55	560,000
0	**1000**	**+60**	**1 volt**
+1	1100	+65	1.8''
+2	1300	+70	3.2''
+3	1400	+75	5.6''
+4	1600	**+80**	**10.0''**
+5	1800		
+6	2000		
+7	2200		
+8	2500		
+9	2900		
+10	**3200**		

All levels cross referenced to a 75 ohm transmission system, source-load impedances and 75 ohm measurement tool. When measurements are made with 300 ohms with a matching transformer converting 300 ohms to 75 ohms, multiply indicated readings by 2.2 to determine real levels at 300 ohms.

SPLIT ISSUE

Effective with this issue of **CSD** those people who have ordered only a single section (such as the Technical Section, which you are now reading) will be receiving only the section ordered. Prior to this time **CSD** has been supplying both sections to all readers simply because the small number of ''one-section-only'' readers has not made it worth our while to separate the issues. However with the subscription list growing rapidly, the time has

come to deliver to you what it was you ordered. If you have grown 'attached' to the full issue (Technical plus Programming) you may upgrade at this point by requesting same (provide your name, address and mailing label) with a $20.00 check attached.

THE SPACECOAST KIT

A BOMBSHELL or A DUD?

The literature sheets and fliers that flooded the home terminal marketplace late in November proclaimed that a $1200 kit or $1600 wired and tested package was soon to be available. With this magic package of electronics you could take your own reflector surface and be in the home satellite video business. Wide distribution of the literature sheets insured that the new pieces of hardware were to be shortly the talk of every conversation where private satellite terminal enthusiasts gathered.

During the Sunday afternoon gathering on the amateur twenty meter band (the 'Satellite Group' meets Sundays at 1900 Z on 14.311 MHz) on November 18th the first enthusiasts who had received the mailing began to ask questions. **Who** knew more about the package? **What** type of hardware was involved? **Who** had designed the package? **What** type of demod was planned? **When** would delivery start.

Dale Hagert of Eagan, Minnesota typified the feelings of many when he noted "For $1600 nobody can afford to mess with building an LNA and a receiver on their own any more...this package has got to be the most exciting thing to hit the low cost TVRO field since the service began!". Hagert was right; even if you opted not to **build** up the modules yourself (some of the Spacecoast modules were completed, others required some assembly work according to the literature) the non-kit $1600 price tag for 'LNA + full frequency agile receiver' looked awfully good. And if you were up to building some of the modules, the $1200 price tag looked even better!

Spacecoast Research. Just who are they and what is this package they offer?

They began by offering a reasonably priced booklet (typically $7.95) which attempts to explain the inner workings of the satellite system to the neophyte. They advertise extensively in a diversified group of publications, from **Mother Earth News** to **Radio Electronics** to **73 Magazine**. And others as well. Their booklet package has apparently sold well, via mail order, and they have turned many people onto the satellite scene. The mail order business is an offshoot of a school the parent firm operates in the Orlando area where individuals are trained for broadcast industry positions. Their credentials for being involved in the satellite industry? Jim Vines of Paraframe notes "I guess they saw an opportunity to make some money, in a hurry, with not much investment or overhead".

Judging from the interest indicated during the Sunday gathering of the Ham 'Satellite Group' a number of people were preparing to fire off $1600 (or $1200) checks to Spacecoast. We were excited also because **if** there was a breakthrough here the number of people participating in satellite reception would multiply very rapidly; just as rapidly as Spacecoast (and others sure to follow) could ship the hardware out the door. And the timing of Spacecoast seemed perfect. If they really had something here, **we wanted to encourage them to appear** at the Miami SPTS '80 to show it off.

As a substantial portion of the letters appearing in this month's CSD attest, people with a strong desire to get their own terminals installed and operating are having more than a few problems locating hard to find component parts. Numerous readers have written asking if somebody wasn't yet manufacturing a kit of boards and parts; some indication to us that the timing was ripe for such an entry into the marketplace. As one San Diego reader wrote to us "I have spent hundreds of dollars on telephone calls and letters requesting assistance on locating microwave parts. All I have for my efforts are some chip capacitors and LNA circuit boards from Robert Coleman!". Truly, there is a great demand for kitted hardware even if only bags of parts and proven circuit boards.

The Spacecoast literature doesn't tell you a great deal about the package. It makes a number of operational claims. What really is the design of the Spacecoast package, and where is it at today? We went to Spacecoast's Steve Reed first to find out.

Our first problem was getting through the answering service Spacecoast utilizes. "Everything you need to know is in the 'manual'" said the young lady. We told her that in our case that was not true; we mentioned our weekly TV show and the possibility that we would hop an airplane to visit Spacecoast to videotape some interviews for the program "if we could find out more about the package in advance' and that got us through the answering service to Steve Reed.

"I am sort of swallowing my words (on the announcement of our kit)...we just had...some fireworks with our engineer and we are going to be delayed on that (product)". What kind of delay? "I believe it is going to be about a sixty day delay".

Could he tell us about what he was shooting for? "We have everything worked out down to 70 MHz...we simply have to straighten out the 70 MHz on down. We have plenty of people who are willing to help us out with regard to the 70 MHz to baseband...".

We asked about the 'front end'. Our study of their literature suggested to us Spacecoast was planning to use the Merrimac DCV-2002 package (see separate report here). "Yes, we are thinking very much towards the Merrimac although our (former) engineer had worked out a way to do that ourselves. The Merrimac package is very attractive with regards to the functional characteristics, the quality of it...if SA uses it, it is good enough for us!"

Humm. The Merrimac package (there are actually three now, with a fourth planned, as the separate report indicates) **is** attractive. It is also very expensive in small quantities (1 to 9) and it doesn't come down substantially until you are using several thousand per year. A firm such as Merrimac would not, we suspected, extend the large quantity pricing to someone that had no track record with microwave manufacture. Spacecoast has no such track record.

"We have this idea in mind. Let us make this package, we believe we can sell it. And as the volume picks up we will negotiate a better price. The volume for 100 per week is there if the total machine can be made. We believe that it is a risk to take to operate at very-very slim margins in the beginning but that's a risk somebody has to take and we want to take it."

The literature sheets circulated in mid-November cited a $1200 'kit' price and a $1600 assembled price. We asked Reed about this. "Yes, that **was** our projected price and **we may have to back off on that** a little bit because of our problems with the engineer. Initially we had intended to do everything in house, microstrip, LNA, all the way down using 'the new' Hewlett Packard chips for the front end (LNA). Because of the tremendous performance of those particular chips we (felt) we could get by with say a ten foot dish for the majority of the country."

The HP chips referenced are another new, **not yet available item**. There has been a great deal of work in places like HP and other 4 GHz transistor houses to create a 4 GHz 'gain block'; sort of a microstrip technology 'gain package' that could be simply dropped into position and wired up. Typical

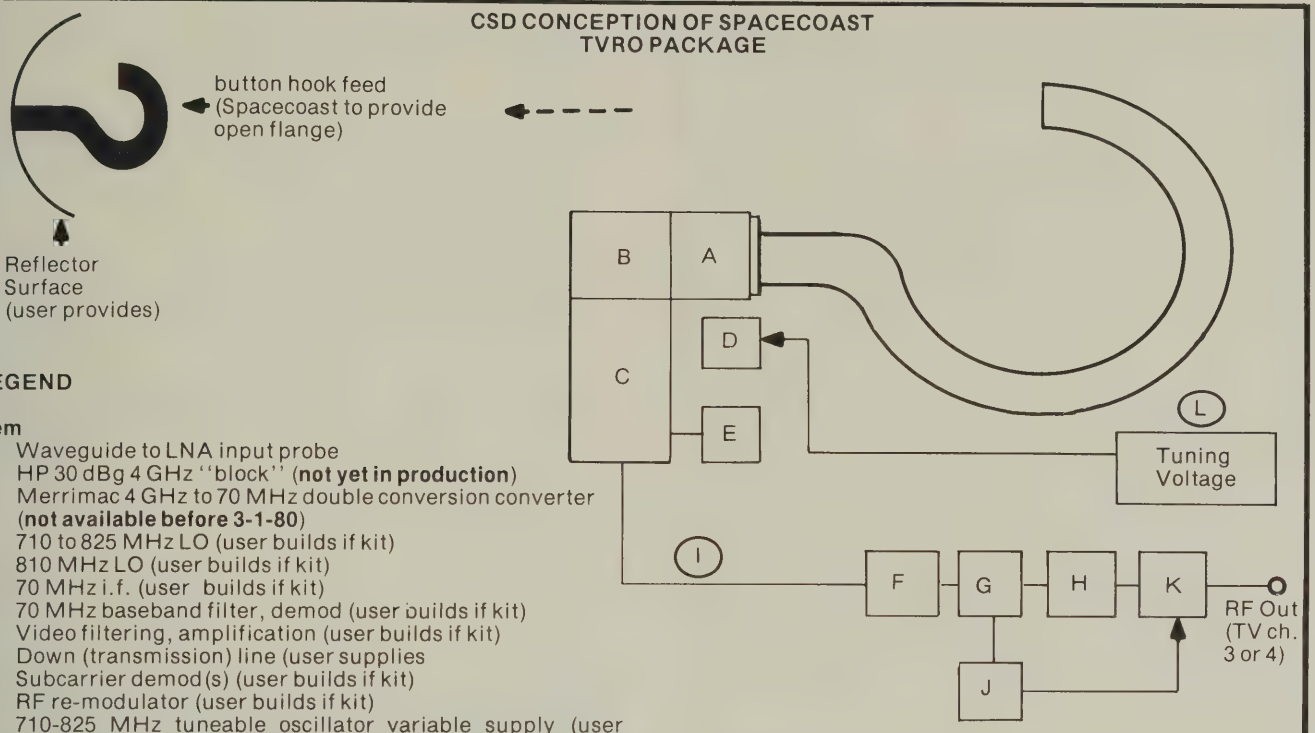

CSD CONCEPTION OF SPACECOAST TVRO PACKAGE
button hook feed (Spacecoast to provide open flange)
Reflector Surface (user provides)
B
A
C
D
E
L
Tuning Voltage
I
F
G
H
K
J
RF Out (TV ch. 3 or 4)
LEGEND
Item
A Waveguide to LNA input probe
B HP 30 dBg 4 GHz "block" (not yet in production)
C Merrimac 4 GHz to 70 MHz double conversion converter (not available before 3-1-80)
D 710 to 825 MHz LO (user builds if kit)
E 810 MHz LO (user builds if kit)
F 70 MHz i.f. (user builds if kit)
G 70 MHz baseband filter, demod (user builds if kit)
H Video filtering, amplification (user builds if kit)
I Down (transmission) line (user supplies
J Subcarrier demod(s) (user builds if kit)
K RF re-modulator (user builds if kit)
L 710-825 MHz tuneable oscillator variable supply (user builds if kit)

DIAGRAM ONE

desired characteristics call for 30 dB of gain in a 'block' with noise figures in the 1.5 to 1.8 dB region (120 to 150 degrees K). **However**, our best sources of information indicate to us that such 4 GHz 'gain blocks' on a chip are in the most optimistic cases 9 months or more away from production and even **when** they do reach the market one can expect them to be in tight supply for sometime. Truly, the TVRO world does need some 30 dB gain 'blocks'. Is Spacecoast designing an LNA front end around something not yet readily available or even available at all?

"We are planning to put 30 dB of gain at the LNA, an approach we believe most modern designers are following. And then we'd do down conversion at the dish (from 4 GHz to i.f.) and save yourself the hassle of forcing a relatively weak signal along a piece of expensive coax."

So Spacecoast intends to leave the dish at 70 MHz? "Well, I think that's the best approach. If we use the Merrimac package then we can place the entire downconverter out at the dish".

Humm again. Placing all of the microwave region electronics at the dish certainly is a desirable objective. Steve Birkill does such things in England with his experiemtnal terminal but he also worries about such things as AFC and somehow controlling the operating frequency of the local oscillator as it sits out there in a changing environment. We asked Reed about running temperature cycles on just the Merrimac portion of the downconverter. "I don't believe that we have gotten to that point yet...the people at Merrimac tell us that SA has been using (the Merrimac down converters) so...". Apparently at Spacecoast the fact that all SA electronics mounts **inside** a nice rack mounting package that is located in an environmentally controlled building has been overlooked.

Merrimac's Vito Carruso explains that while the DCV series of downconverters are typically 'flight rated' for 0 to +50 degrees C the rating is for 'go or no go'; the **stability** of an oscillator, for example, is not currently measured under varying temperatures. "We are concerned that the package continues to perform as a basic downconverter" notes Caruso "and not what happens with the oscillator stability". Of course there are several versions of the DCV series; in the one apparently intended for use by Spacecoast, **they would provide** the builder/user **with their own LO modules**. Anyone who has tried to stabilize an oscillator in the 800 MHz range knows how unstable **low cost** oscillators in this region can be; especially when subjected to outside temperature extremes!

So we suggested to Reed that he might want to rethink that aspect of his package. "I understand you are saying there are dangers in placing it out at the dish. We would intend that the indoor unit, if in fact the Merrimac package were to go outdoors, is trivial in simplicity and would not have to be located right on top of the TV. It could be mounted or installed next to the armchair or that sort of thing where a person could readjust the fine tuning when he needed to do so.

"We are still evaluating other sources. The thing that upsets me about the Merrimac package is that it is impossible to second source. In this industry we don't want to be hit by the kind of delivery delays that crippled other growing industries."

Well, there seems to be several indications here that perhaps Spacecoast was, as Reed suggests, 'premature' in their announcement; a great many delays they are presently blaming on an engineer with whom they have been associated (on an apparent consulting basis). "It is not as if we have cut off communication with the engineer...he is an academic guy, very talented, but he is having trouble with deadlines. So we are looking to find alternate sources for the parts...**if** he can get his design to work, great, it's fantastic. But, if he can't, we think there is a large market out there that the 'majors' are overlooking. I'm not worried about SA or Gardiner or Microdyne...I think we should all together be worried about the Japanese coming in here (with very low priced mass produced terminals)".

Perhaps a bigger concern of Spacecoast at the moment **should be** their working out the admitted bugs in **their** system. Completing the design certainly has first priority (after responding to the inquiries that are now flooding in and returning those checks that eager beavers are enclosing). Just how does all of this sort out?

Understand that the editorial digging we did was late in November. Given the month interval certain things can

change. Others cannot. As best we can determine, Spacecoast had an outside consulting type who had designed, **on paper**, a complete from scratch receiver that included an LNA. He apparently planned to use an HP chip-type '4 GHz gain block' which HP sources suggest to us is now working well in the1.2 to 1.5 GHz region but is still a long ways (even as an experimental device) from 4 GHz. They also apparently **initially** planned to utilize their own microstrip technology to build the downconverter from 4 GHz to 70 MHz. According to Reed the consultant had never shared with Spacecoast any design information on the 70 MHz (i.f.) to baseband portions; if indeed he had it worked out even on paper. At some point the tentative decision was made to not attempt to go from no electronics manufacturing history straight into microstrip technology; but rather to buy outside the Merrimac DCV-2002 4 GHz input and 70 MHz output downconverter. Then it all fell apart; the engineer quit or was terminated or they got into some type of argument. But the mail out fliers were in the mill and gone; long before there was a working prototype of **either** design approach.

Reed notes "We really got caught with our pants down a little bit on this, with the engineer problem, but we are determined that we are on the right track and we are determined likewise to pursue it."

Spacecoast is not giving up but it may be considerably longer than Reed's optimistic "60 days" (from late November) before they get their act really together. The $1200 kit version initially announced would work this way: "We'd supply all of the microwave portion completely built up". Does that mean the kit builder only builds 70 MHz down (since the Merrimac portion gets you to 70 MHz)? "No, we might have the kit builder start higher; such as with the local oscillators". As the separate report here notes the DCV-2002 requires a **pair** of LOs (being a double version 'machine'), both operating in the 700-800 MHz regions. The Spacecoast literature also notes that the buyer gets a 'feed' for his antenna. We wondered just what configuration that might be.

"Yes, we'll supply a feed but it is a trivial thing. What we intend to use for our feed is a buttonhook design; simply an open flange". Spacecoast also talks about having the ability to 'cool' the LNA (see November **CSD**, page P16 for a report on thermo-electric cooling) and Reed feels that if they utilize a buttonhook (simplistic feed that actually consists of a piece of waveguide slightly flared or not flared at all that is open towards the dish surface) that will make it possible for them to **later investigate** cooling.

MERRIMAC PART OF THE KEY

Reed points out that in the kit version the builder will probably be responsible for the LOs and the 70 MHz to baseband portion. How the LNA will be resolved is unclear. This suggests that the Spacecoast package may (and this is **our** conception) end up looking something like **diagram one** here. Reed may be suggesting that virtually everything through G could be located outdoors. While that is technically feasible it is **CSD**'s feeling at this point in technology that the less you have outdoors the better for the time being.

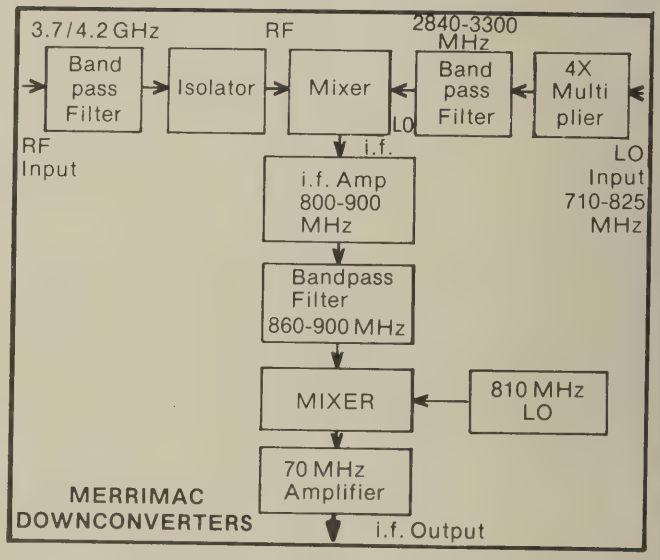
The 'heart' of the system is the Merrimac unit. Just what is the status of the DCV series units at this point in time? We went to Merrimac to find out and Dan Brodow, Vice President of marketing told us "We are now looking at March first delivery for the first units. By the first of February we will be far enough along with the early production on this unit that we can **then accept orders** with a thirty day turn around between order receipt and shipping".

What did Brodow know about Spacecoast Research's interest in their unit? "My people tell me they called us and we sent them the brochures...however I don't know if we have had any serious conversations with them yet. As far as I know they have never gotten (any) samples from Merrimac". And if Spacecoast suddenly turned in an order for DCV 2002s on say December 1st? "They would get their first order around March 1st".

BOTTOM LINE?

We hope Spacecoast makes it. Somebody, in fact numerous somebodies, could do very well in this marketplace right now if they had a quality, proven, properly de-bugged package on the market. Too many people are spending too much time chasing parts that can't be found and such time spent is time lost. As an interim measure, just having a full set of high quality boards would be a step in the right direction. **CSD** has talked with several people / firms that seem interested in doing just this, but for now no one is deliverying. We'll keep you advised. In the interim, keep your money at home.

THE MERRIMAC DOWNCONVERTERS
Manufacturer: Merrimac Industries, Inc., P. O. Box 986, W. Caldwell, N.J. 07006
Products: DCV-2000 810 MHz 2nd LO (+/- 1 part 10^4 p/m stability) $1350
DCV-2001 810 MHz 2nd LO (+/- 1 part 10^6 p/m stability) $1500
DCV-2002 no LO $1150
RF Input: 3.7 to 4.2 GHz
Input Level: -60 to -30 dBm
Input Noise Figure: 13.5 dB (max)
Conversion Gain: +15 dB
First i.f. Center: 880 MHz (others available)
Standard Bandwidth: +/- 20 MHz at 1 dB; 30 MHz at 3 dB
Second i.f. Center: 70 MHz
First LO Range: 710 to 825 MHz (user supplies)
Second LO Range: 810 MHz (DCV-2000, DCV-2001)
LO Drive Level: +10 dBm
Power Requirements: +15 VDC, 300 ma.
Connectors: RF input (N female), LO input (SMA female), i.f. output (TNC/BNC)
Contact: Dan Brodow (201-575-1300)



ACTIVE MIXER BOARD

The October (1979) issue of **CSD** carried a technical report on the Robert Coleman active GaAs-FET mixer plus VTO 8360 local oscillator source. Those who attended SPTS '79 had the opportunity to see Coleman describe his low cost, high performance front end which employs one or two stages of GaAs-FET LNA feeding the amplified 4 GHz signal directly into an 'active mixer' built around the HFET 1101 (HP) GaAs-FET. Coleman's approach is to reduce the 4 GHz gain requirements. By lowering the amount of gain required the system designer is able to spend less money on front end parts and simplify the system in the process.

The October report showed the circuit diagram for the 4 GHz to 70 MHz active mixer plus the Avantek VTO 8360 LO source. Shown here is the **actual circuit board** layout (real size)

in both positive and negative form to allow you to print directly from the magazine to make your own 4 GHz mixer/LO section. See the October issue report for the full schematic and parts listing.

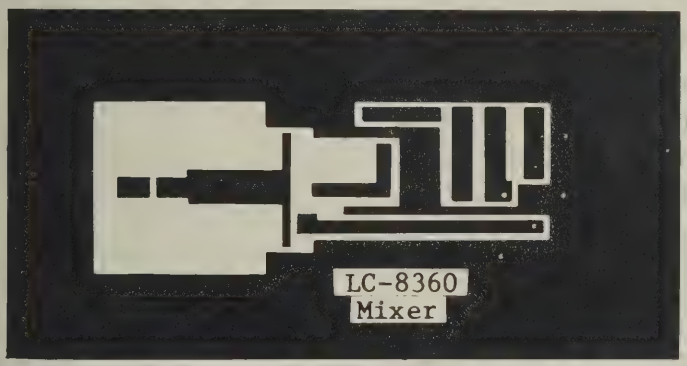
The circuit board shown here (LC 8360) is available directly from Robert Coleman (RFD 3, Box 58-A, Travelers Rest, S.C. 29690) printed on teflon Duroid board for $25. Additionally, attendees at SPTS '80 in Miami in February will be able to see the completed unit and discuss its design and operation with Coleman.

In a related development in the active mixer area, at least one commercial equipment supplier has been working on a balanced active mixer and their results to date are instructional for those experimenting in this area. The **tentative conclusion** of this firm is that the GaAs-FET device (for single ended or devices for doubly balanced mixers) may **not** be the ideal transistor for the application. They report that because the GaAs-FET is such a linear device with a considerable dynamic range it is their current belief that a quality 4 GHz rated bi-polar such as the HXTR series of transistor may be more suited to this application. Any mixer needs to be driven into a non-linear range they point out and the GaAs-FET may indeed offer a low internal device noise figure but it requires very large amounts of drive (one source said "watts") for **efficient** mixer operation service. The HXTR device (commonly employed in the Howard Terminal LNA system) on the other hand will have a higher internal noise figure but because it is not as linear as the GaAs-FET and has a lower dynamic range it should produce more conversion-circuit-gain. Several people

COLEMAN TERMINAL UPDATE

are known to be working on experiments with the HXTR as an active mixer and perhaps some preliminary reports will be available by SPTS '80.

In the interim Coleman's HFET 1101 **is** producing excellent quality pictures as a single ended active mixer and one can only hope that if the HXTR bi-polar approach to active mixing is superior that even simpler (and lower cost) down conversion from 4 GH to a suitable i.f. will follow.



THE COMPONENTS SCENE

FEEDHORN SOURCE

If you have been having good luck running down a parabolic antenna for your system but are having difficulty adjusting to a shortage of suitable feedhorns with the proper flare to match your parabolic antenna, here is a good source that produces a high quality horn at a reasonable price. **ECA** (P.O. Box 2029, Grove, Oklahoma 74344; Tony Bickel at 918-786-5349) has an extensive line of horns constructed to near-mil specs from brass (flange) and copper (the horn) which end up in the standard CPR 229G flange plate. Price is $78.50 in quantities from 1 to 24 and there is a ten percent price drop for 25 up. This is for U.S. or Canada or Mexico shipment via (UPS or) parcel post. ECA keeps an inventory of these horns in stock although your particular f/D may not be a stock item. You must know the focal length to diameter of your antenna (f/D) before you can order; ECA can supply standard designs in the 0.3 to 0.6 f/D region for the price quoted here. Several of the cable TV antenna firms utilize the ECA horn as part of OEM packaging and our **CSD** terminal has an ECA horn now into its third year of (troublefree) operation. ECA also has a good stock of RG-214/U, 1/2" and 7/8" cable plus appropriate (Prodelin at the moment) fittings in stock so if you get into a bind locating appropriate fittings, right angles, adaptors or whatever you might try this source.

1200 MHz HOWARD SECTIONS

One of the more difficult portions of the Howard Terminal to run down is the 1200 MHz bandpass filter and amplifier. The 1200 MHz segment of the **original** Howard Terminal receiver was built around modules which Tay Howard obtained from Paul Shuch at Microcomm in San Jose, California. At the time Shuch provided the modules he was contemplating offering them commercially and in fact numerous early references to the Howard 1200 MHz segments sent the reader to Shuch for these modules. Subsequently Shuch competed design for a **full** 4 GHz to baseband receiver which he licensed International Crystal Manufacturing Company (ICM) to manufacture. The current ICM receivers which you see advertised here and on

display at SPTS gatherings are largely Shuch designed receivers.

With Shuch not building the 1200 MHz modules where does that leave a builder who wishes to duplicate the Howard Terminal (manual) receiver? Well, the Howard Terminal Manual references the reader to the December 1975 issue of **HAM RADIO Magazine** in which Shuch described the same 1200 MHz region bandpass filter. Included in that description is a board layout for the bandpass filter. In the **Shuch RX-4200 User's Manual** (available for $25 from Microcomm, 14908 Sandy Lane, San Jose, California 95124) Paul describes in great detail this segment of the (ICM) receiver and includes board layouts for the filter and amplifier portion. Shuch has also recently agreed to supply "as long as the demand is small or the supply does not run out" some of the variable capacitors required for that bandpass filter, directly, to home builders. However the variable capacitors are not as difficult to find as the boards themselves. Many people have simply taken the artwork from either the RX-4200 Manual or from the original Ham Radio article and have produced the filter (and/or amplifier) boards. **Lindsey Riddle** of New Orleans (5546 Bellaire Drive, New orleans 70124) is one of those and while Lindsey has no intention of going into the 1200 MHz board 'business' he has offered to make up **some** boards for people who are **really desperate** on this portion of the package.

The same **Ham Radio Magazine** in their October 1975 issue has an article covering the Shuch 1200 MHz amplifier. However as the Howard manual suggests, Taylor believes that a person building a receiver from the Manual can really forget the 1200 MHz amplifier portion as long as you use four stages (40 dB of gain) at 4 GHz as he has done with his bi-polar LNA package described in the manual. Shuch does not agree, and preaches 'balanced gain' split between the 4 GHz segment, the 1200 MHz segment and the 70 MHz segment. In actual fact, Howard's package without gain at 1200 MHz does work as does Shuch's with gain at 1200 MHz so both appear to have valid points.

Into all of this comes **International Crystal Manufacturing Co.** (attention Royden Freeland, 10 North Lee, Oklahoma City, OK 73102) which now offers to supply for $160 the Shuch/ICM1200 MHz receiver portion that includes both the bandpass filter **and** the 1200 MHz amplifier. This is a built-up, wired and tested price and ICM should be delivering at this time on this item.

THE WORLD ABOVE 10 GHz

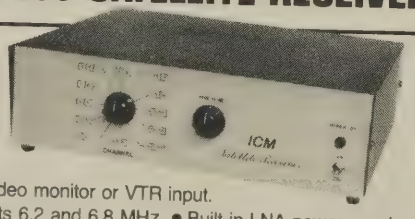
by
Robert M. Richardson
Richcraft Engineering Ltd.
Drawer 1065
Chautauqua, N.Y. 14722
[716]753-2654

SUMMARY

Last month's episode described our serendipitous discovery that an FM/FM television video/audio signal transmitted on the 10 GHz band with an ordinary low-cost Microwave Associates' Gunnplexer module and $7.00 Snow-Sled 25" parabolic reflector could be transmitted over a 2+ mile path and be received with a similar Gunnplexer/parabolic dish. The receiver's i.f. signal is then amplified by an ordinary windband TV preamp and then fed **directly into any** standard American/Canadian (NTSC) TV receiver (AM video/FM audio) which delivers "studio quality" video and audio **with absolutely no processing whatsoever**.

NEW ICM TV-4200 SATELLITE RECEIVER

Provides You With These Features For $1,995



- Output levels compatible with video monitor or VTR input.
- Dual Audio Outputs 6.2 and 6.8 MHz. • Built in LNA power supply
- Tunable Satellite channels 3.7-4.2 GHz.

International Crystal Mfg. Co., Inc.
10 N. Lee Oklahoma City, Ok. 73102 405/236-3741
ICM

GENERAL

Let us philosophise a moment on the reason why FM/FM video and audio transmissions and reception by AM/FM TV receivers had not been discovered and/or published during the last 1/2 century of television development. We have 2 probabilities:

1) Until quite recently it has been difficult to generate truly **linear** wideband FM video signals at VHF frequencies. Let's assume we desire to generate a video FM signal at 55.25 MHz (channel 2) with + and - 4.5 MHz deviation and a modulation index of 1; 9/55.25 = approximately 16% and that's a whole bunch. At 10 GHz it = only 1/10 of one percent, which is easy to accomplish with good linearity.

2) This is the most probable reason: a 55.25 MHz carrier AM modulated with a 4.5 MHz (or less) video signal is very easily filtered (vestigial sideband), thus reducing bandwidth per channel and increasing the number of channels for a given frequency spectrum. By filtering out the lower sideband of a video AM and audio FM signal the channel spacing now in standard use in the U.S. and Canada is 6 MHz rather than the 9 to 10 MHz (**with** guard band) that a non-filtered signal would require.

On the 10 GHz band, 500 MHz wide, spectrum availability is no problem at all so we may use the ultra simple FM/FM approach and provide a guard band by spacing each channel 12 MHz and using only **every other** channel when we heterodyne down to the VHF TV Channels.

SYSTEM CONCEPT

The author's new book, "**The Gunnplexer Cookbook - A Microwave Primer**", (to be published now in the spring '80 by the Ham Radio Publishing Group, Greenville NH 03048), covers the standard approach to transmitting and receiving TV signals with the 10 GHz Gunnplexer modules; i.e., the received FM i.f. video is first amplified about 60 db and then converted (in a bridge discriminator) to AM video which is then amplified and AM modulates a low TV channel oscillator which feeds a standard TV receiver. The FM/FM techniques presented from this point on are all new **and have never been previously published.**

This month we will expand on the basic 'Richardson effect" FM/FM system and provide adequate data for the advanced microwave experimenter to build and test a system. Next month we will begin going into the nitty-gritty detailed instructions and schematics that should allow newcomers to the microwave bands to build their own operating Gunnplexer system for TV relay/computer data link/TV distribution that will easily handle 7 channels using a standard TV receiver as the tuneable i.f.

FIGURES 1 and 2

Let's run through last month's block diagrams illustrated in Figures 1 and 2. For this discussion we will assume that the **transmitting** GPX, for the channel 2 signal, is adjusted to

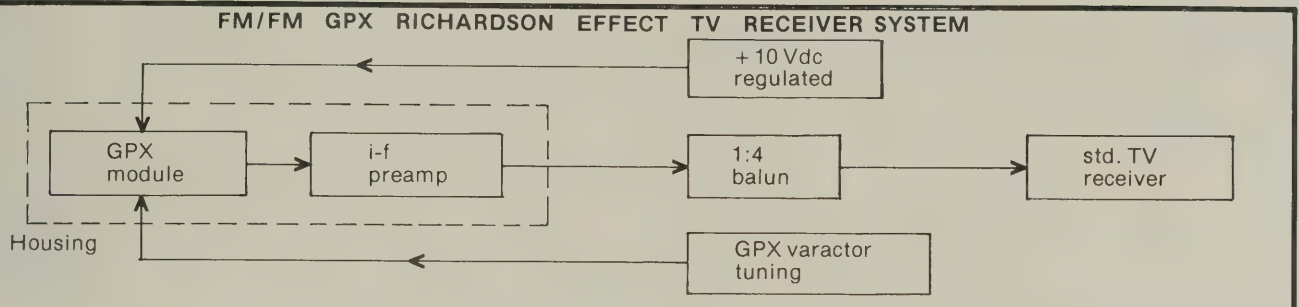


Figure Two

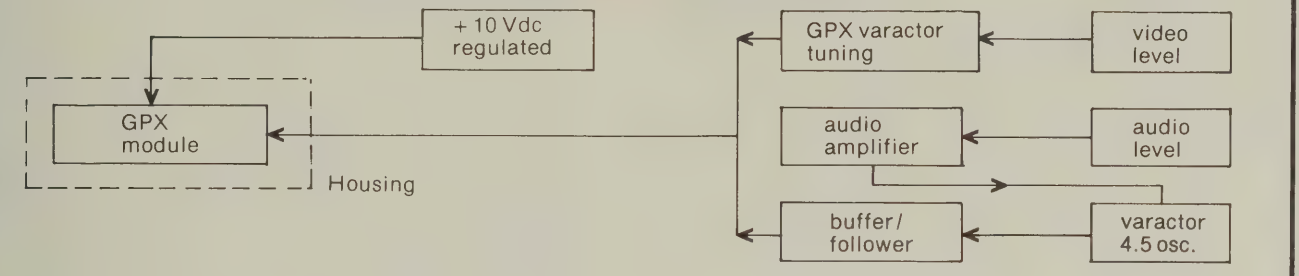


Figure One

deliver exactly 10.179750 GHz output with a varactor voltage of +4.0 Vdc. This may be done quite simply using the methods presented in "The Gunnplexer Cookbook," or with a microwave digital frequency counter for those lucky enough to own or be able to borrow one (we are not that lucky). The receiving GPX module is similarly set to 10.235000 GHz output, also with its varactor voltage at +4.0 Vdc. The discerning reader will note that 10.235000 - 10.179750 = 55.25 which **just happens** to be the video carrier frequency of TV channel 2. From now on we will leave off the kHz so we may deal in round numbers; i.e., 10.179750 = 10.180 GHz.

The frequency of 10.235 GHz for the receiving GPX was selected for 2 reasons. **First** - it is 15 MHz below the standard amateur calling frequency of 10.250 GHz on this band and should be well out of anyone's way. Also, it is 15 MHz above 10.220 GHz which is one of the two possible frequencies when operating duplex with a calling station and both stations utilize a 30 MHz i.f. **Second** - if GPX TV relay/distribution systems proliferate, as well they may, 10.235 GHz offers a convenient marker/beacon frequency almost dead center in the amateur band. The unmodulated 10.235 GHz 10 milliwatt signals would serve admirably well for checking propagation conditions.

Also, with their 5 degree beamwidth, these **unmodulated** signals should cause no interference problems whatsoever to any other user of the 10 GHz spectrum. Actually, no one will even know they are there for all intents and purposes as this band is shared with pulse systems in the multi-100 kilowatt range.

Transmit GPX (GHz)	Receive GPX (GHz)	i.f. Output (MHz)	TV Channel No.
10.180	10.235	55	2
10.168	10.235	67	4
10.152	10.235	83	6
10.060	10.235	175	7
10.048	10.235	187	9
10.036	10.235	199	11
10.024	10.235	211	13

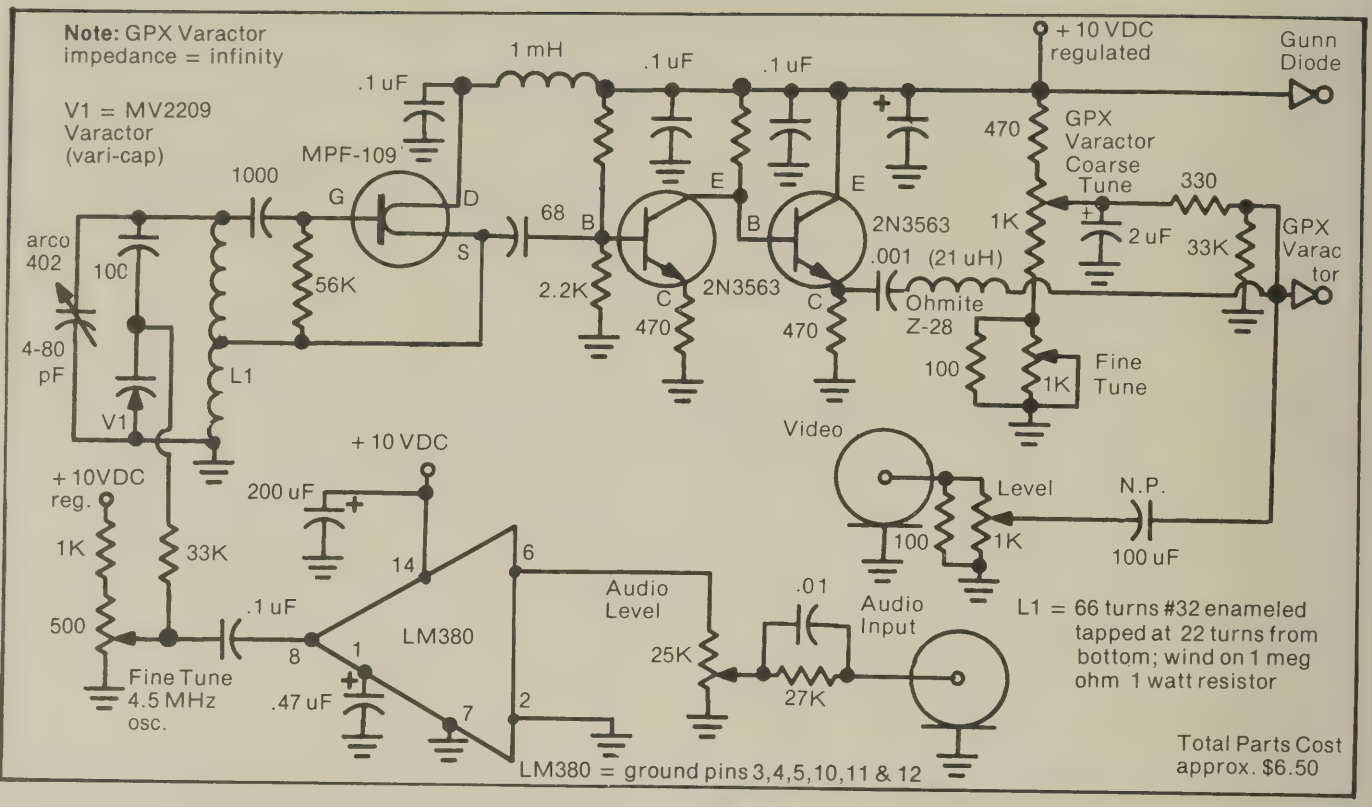
-TABLE 1-

Table 1 illustrates a frequency plan that might be used to provide 7 TV channels on the 10 GHz amateur band, that would not cause interference to any known existing services. (An easy to obtain FCC radio amateur "Technician Class" license is all that is necessary to **legally operate** on this microwave band.) One interesting aspect of the author's frequency plan is that **all 7 channels** may be received by a **single** fixed-tuned GPX receiver. Only the TV receiver need be tuned to the desired channel as the receive GPX i.f. output is amplified by a broad band low-cost TV preamp before being fed directly to the TV set/distribution amplifier. An obvious application would be providing a small community (about 200 homes) across the lake from the author's home with 7 channels of satellite TV.

Figure 2 shows the i.f. preamp mounted in the GPX housing. This preamp may be any variety of wideband TV preamp covering the VHF channels such as the Radio Shack #15-1134 with 18 dB gain or the Winegard #7A2664-4 with 24 dB gain for longer coax runs from the GPX housing to the TV sets/distribution amplifiers. We recommend that well shielded RG59/U coax cable be used for all runs between the GPX housing and indoors on both the transmit and receive systems to avoid extraneous signal pickup. The receive system's GPX varactor tuning may be located in the GPX housing, but for initial tests by all means make it remote (indoors) fed with RG59/U coax until you become familiar with the **GPX Cookbook's** proportional temperature control and total system operation as climbing up a steep snow covered roof is no fun at all when channel 2 has drifted out of your TV set's fine tuning range. Proportional temperature control will maintain your GPX module temperature at set temperature plus or minus 1/100th degree F from -20 to +100 degrees F. At about $4.00 parts cost it is well worth the investment.

TRANSMIT VIDEO/AUDIO DETAIL

Figure 3 is a schematic of the audio amplifier, 4.5 MHz audio subcarrier oscillator/buffer chain, and combined video/audio feeding the transmit GPX varactor. The video signal should be 1/2 to 1-1/2 volts peak to peak into a 75 - 100 ohm load. Its source is up to you. It may be taken from a TV receiver's video output, a TV camera, a video recorder, or more appropriately for satellite buffs out there in the hinterlands,



borrowed from **"The Big Headend In The Sky"**. Much like re-constituted lemon juice, we must modify the satellite TV signal format before we can use it. Those big birds' 20+ MHz deviation with audio subcarrier at 6.2 or 6.8 MHz must first be demodulated to raw video and audio by your satellite receiver's video and audio phase lock loops and/or discriminators. Now that we have at least 1/2 volt peak to peak of raw video and a few millivolts of raw audio (no matter the source) let us proceed with **Figure 3.**

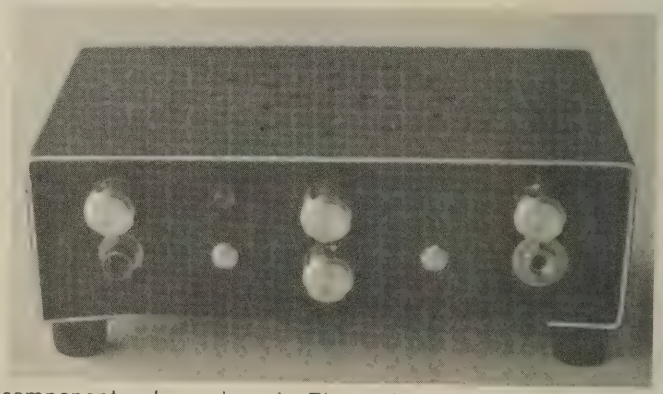
The 27K ohm resistor and .01 pF capacitor combination in the audio input line serve as a simple but effective pre-emphasis network so your TV receiver's audio has that clean crisp Hi-Fi sound. The 25K ohm potentiometer on pin 6 of the LM 380 audio amplifier allows us to adjust audio deviation (more later). The novel MPF-109 4.5 MHz Hartley oscillator is "coarse" tuned on frequency with the Arco 402 4-80 pF trimmer capacitor and "fine" tuned to exactly 4.5 MHz with the 500 ohm potentiometer varying the tuning voltage to the MV2209 vari-cap (varactor). The MV2209 serves two purposes:

1) Allows us to "fine" tune the 4.5 MHz audio subcarrier;
2) Frequency modulates the MPF-109 with exactly 75 kHz max deviation which is determined by setting audio level.

The two 2N3563 buffer/amplifiers serve to isolate the MPF-109 oscillator. The "coarse" and "fine" GPX varactor tune controls allow us to set the Gunn oscillator exactly on frequency; like 10.180 GHz for channel 2. The Gunn oscillator is tuned as close as possible to 10.180 GHz (**GPX Cookbook** techniques), at a varactor voltage of +4.0 Vdc with the GPX Gunn diode cavity tuning slugs (ceramic), and then final tuned with coarse/fine. With proportional temperature control (PTC), this is exactly where it will stay.

The GPX receiver system is tuned in a similar manner to 10.235 GHz. If you have tuned both the transmit and receive GPX modules carefully, both should be on their respective frequencies with a varactor voltage of +4.0 Vdc + or - 100 mV.

Figure 4 is a photo of the transmit GPX system control module as demonstrated at the April '79 Dayton Hamvention. Controls are left to right: video level/video input, GPX varactor voltage course/fine, and audio subcarrier frequency control/audio input. The audio level control is on the rear panel. The



component values given in Figure 3 should yield an audio subcarrier approximately -10 dB down from the video signal. Don't worry about it as there is considerable room built in for adjusting a perfect picture with audio level just **below** the level where sound bars appear with peak audio input.

FINAL TUNE-UP PROCEDURES

1 (Allow about 10 minutes for both GPX modules to temperature stabilize (heat soak) if you are using proportional temperatre control. If you are doing this indoors, forget about proportional temperature control and parabolic reflectors and allow about 30+ minutes for your GPX modules to temperature stabilize. The systems demonstrated at last spring's Dayton Hamvention ran 3 days indoors without further adjustment; (**although no one**, except Bob Cooper, **knew it was an FM/FM system** run straight into two brand new **unmodified** 19" Admiral TV sets...no preamps, no PTCs, no parabolic dishes!).

2) With video input between .5 and 1.5 VAC peak-to-peak, aim your two GPXs (if with dishes) at some reflector a long-long away (like across a 1.5 mile wide lake at an aluminum sided barn).

3) With the transmit audio control fully retarded and video level control 1/4 turn open, **slowly adjust** the varactor "coarse" tuning control for highest contrast picture, and then back-off a "hair". Since the TV receiver is your primary test

scope (and a very sophisticated one indeed), make sure its **fine** tuning control is in the center. The transmit varactor "fine tuning" control and transmit video level control should now be adjusted (back and forth) for a perfect picture, as they interact somewhat.

4)Turn-up the TV receiver's volume control til you hear a hiss, and adjust the transmit GPX's 500 ohm audio "fine tune" control **for full quieting**. This will occur at exactly 4.5 MHz.

5)Slowly advance the transmit GPX's 25K ohm audio level control until sound bars (with music or whistling) just appear on the TV video display. Carefully retard the audio level control until the sound bars "just" disappear. That is all there is to it. **Ridiculously simple wasn't it!**

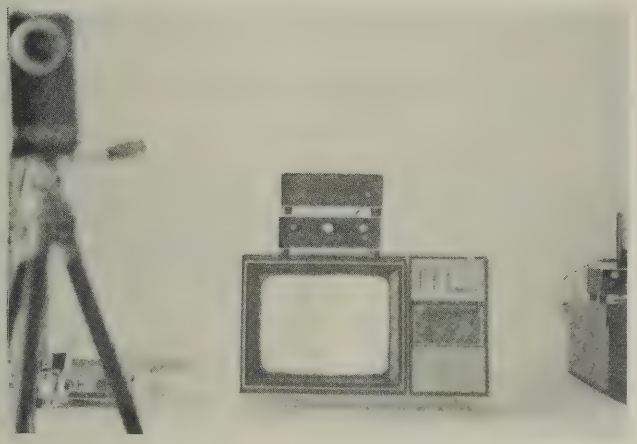


Figure 5 is a photograph of the photographer photographing a TV receiver with his picture on the tube. The 10 GHz signal is only a REFLECTION from ACROSS Chautauqua Lake which is about 1-1/2 miles wide here. **More next month.**

RICHCRAFT ENGINEERING LTD.

Richcraft Engineering, Ltd. offers you a no-charge computer generated printout of a) true heading, b) elevation and c)range from your location to: COMSTAR I,II,III;SATCOM I,II,III & WESTAR I,II,III. Please include your location's longitude and latitude (from a road atlas OK) and $5.00 to cover postage and handling. Send to Richcraft at Drawer 1065, Chautauqua, N.Y. 14722 (telephone 716-753-2654).

SATELLITE TV EXPERIMENTERS
INTRODUCING A COMPLETE
3.7 — 4.2 GHz DOWNCONVERTER
•3.7-4.2 GHz in, 70 MHz out
•Remote one control tuning
•Dual c[illegible]sion - stable
•Asser[illegible]ested Only $895.

THIS PRODUCT NO LONGER AVAILABLE

Polar[illegible]mote Feed Rotation
[illegible]r Dish.
[illegible]stpaid

E[illegible]PLIES
•Teflon [illegible] 55
1/16"x9'[illegible]
1/32"x9"x4
•Chip capacitor [illegible]27,
39, 220, 4700 pf...
•SMA and microwave [illegible], inquire
•2"x14" copper tube for [illegible]l feed, 3 lbs. $12.00

WRITE - We are adding to our inventory!

SATELLITE INNOVATIONS
P. O. Box 5673
Winston Salem, N.C. 27103

Add $2.00 shipping and handling (except for plans)

TECHNICAL CORRESPONDENCE AND NOTES

UNSIGNED DESPERATE NOTE

This is a desperate note from a frustrated man trying to find electronic components and parts for LNA's. I can't get copper plate or strap. I can't get nuttin! Somebody should **please** put out a packaged kit of **everything** a builder needs to assemble an LNA, and the receiver. Here in San Diego the parts houses have nuttin' and that includes people who know nuttin' about microwave components and associated equipment and parts. I have spent hundreds of dollars on phone calls, letters and so on and all I have for parts are some capacitors and a PC board from Robert Coleman. Please... somebody!

(someone in...)
San Diego, California

Yeh. It can be frustrating.That's one of the things pioneers have to put up with. If everything was neatly piled up in nice little boxes with clear instructions, we'd have millions rather than thousands of people participating. There is no doubt that there is a substantial market out there (we believe it is in the tens of thousands right now) **for well done "kits" in this field. We have reason to believe that at least one substantial name in kit design and marketing is looking hard at this field. If you attend SPTS '80 in Miami, look carefully at the name tags. You might be surprised who is in attendance.**

WANTS HELP IN CANADA

Looking at all of the material I have collected on the subject of satellite TV, I must admit that I am not an electronics engineer. The safest course would seem to be to assemble a kit from the Howard Terminal. Unfortunately I don't know of anyone who is offering such a kit. Can you please update me on when such a kit may come out? Or, do you know anyone (preferably in the eastern U.S.) who could build up a module at a time and ship it up to me here in New Brunswick? My primary concern is that lacking a solid background in electronics I may put something in backwards and blow out several hours work.

I intend to install my terminal inside of my geodesic dome (45 foot) that covers my year around swimming pool. At the moment it is technically not legal to have a private terminal and

certainly not one that tunes in U.S. satellites. I am hopeful that soon the government red tape will clear away. To me it is ironic that the same Canadian government that outlaws private terminals is out there donating 100 11/12 GHz private terminals for ANIK B to people living in northern rural areas. It is a classic case of do as I say, not as I do! I greatly enjoyed the first issue of CSD; congratulations and keep up the good work!

W.A.R.
New Brunswick

The suggestion that somebody should be making up the circuit boards for the Howard Terminal manuals is an excellent one. Taylor Howard has stated repeatedly that he is perfectly happy to see people duplicate his work (either for private use or for commercial re-sale and use). **Tay is just that kind of guy, as is Robert Coleman with his innovative work. Somebody with time on their hands and a familiarity with building up modules might consider starting a little mini-production line in the den on evenings and weekends. We'd be happy to publicize it here and we are saving W.A.R.'s full name and address to forward to the first individual that wants to get into business for himself in this area. As this reader says, Canadian authorities are still pretty mixed up over how to handle this new technology so we think it might be a mistake to simply list his full name and address here openly at this time!**

LOOKING FOR HARDWARE

The Australian Government has recently announced a go ahead for domestic satellites. Alldesign Services is an electronic design consultancy that specializes in closed circuit television systems. The recent government announcement has prompted us to examine the prospects of diversification into satellite broadcasting and reception. We are particularly interested in the current technology available for small domestic earth stations for reception of signals. Can you help us get in contact with firms that offer hardware in this field?

Eddie Jurkiewicz
Alldesign Services
54 Carrick Street
Woodlands, W. Australia
6018, Australia

Readers looking to make contact with an agressive Australian/Pacific/SE Asia electronic firm with an interest in helping domestic satellite services develop there should contact Eddie Jurkiewicz directly.

WILLING HANDS

It has been a long time since I have become so fascinated and enthusiastic about a subject as I am with satellite television. I would like to get involved as much as I can in this expanding technology. During my professional career I have designed many products in the TV field and have several patents on antennas. If there is any way I can help please let me know.

Keith T. Peterson
2835 Ninth Avenue North
Fort Dodge, Iowa 50501

Peterson has an attractive resume and a good history of innovation in television and antennas. There are many people out there looking for professional help in designing TVRO products and Anderson is available.

FOR YOUR EARTH STATION, CHOOSE
AVCOM'S PSR-3
SATELLITE VIDEO RECEIVER
DESIGNED FOR YOUR PRIVATE TERMINAL
- Remote tuning
- Dual video outputs
- Exclusive Clamp-Sync & Scan-Tune
- Many other features!

AVCOM of Virginia, Inc.
10139 Apache Road, Richmond, VA 23235
(804)320-4439

TECHNICAL NEWS NOTES

Direct to home satellite broadcasting received indirect support but **not approval** at conclusion of WARC '79. Frequency band 12.3 to 12.7 GHz was allocated worldwide but U.S. government sources see project at least ten years away here. Several additional conferences in 1983-1986 period are ahead before plans can stabilize.

COMSAT meanwhile still intends to submit proposal to FCC for their version of 2-6 channel 12 GHz direct to home broadcasting in February. Latest proposal calls for one channel to be utilized for 'national university of the air'; at-home college level courses.

Uplink frequencies for broadcasting satellite approved by WARC are 10.7 to 11.7 GHz for Europe, Africa and Asia plus 14-14.8 and 17.3-18.1 GHz; latter uplink bands will also be available for Western Hemisphere. In supplemental action 14 GHz region will be allowed for TV news crews to directly inter-connect to satellite systems for direct news feeds.

President Carter has promised NASA emergency infusion of $300 million to get Space Shuttle program back on track. Meanwhile additional delays keep cropping up setting all shuttle schedules into cocked hat.

Spanish International Network's first UHF translator has gone into service in Denver area; 1,000 watt unit on channel 31. SIN plans additional satellite fed translators for Bakersfield, Austin, Tucson, Detroit, Washington and other cities shortly. SIN projects 90 such markets nationwide as being suitable for translators fed by satellite.

Present 3.7 to 4.2 GHz 'fixed' downlink band was expanded by WARC to **add** 3.4 to 3.6 GHz in most areas of world; **U.S. is exception** because of military radar system operating there. Russians have been using frequencies below 3.7 GHz for some years.

Scientific Atlanta is now shipping its own in-house manufactured LNA units and delivery of quantity 10 foot (3 meter) dishes also begins this month.

Launch of RCA SATCOM FIII went off with no major hitches: bird is now in flight check out mode and when completed in February or early March most existing cable services will switch to FIII from FI. A full run down of FIII and FI channel assignments will appear here in CSD as soon as they are formally announced.

COOP'S COMMENT ON PROGRAMMING

AN UGLY TREND?

Elsewhere in this month's programming section appears a report that ESPN has raised their 'private' viewing fee to $100; for a lifetime connection. ESPN is the all sports channel on transponder 7 which operates 24 hours per day through the weekends and around half of the time during the week. Earlier announcements about ESPN's rates had them charging someplace between $1.40 and $2.40 per viewing home for life. It turns out those are five-year-agreement rates for homes connected to ESPN **through** the local cable system. ESPN is willing to accept the private terminal viewer's $100 and our report details what is involved.

The SPN mystery is more complex. SPN is the transponder 21 service which now operates 24 hours per day. It is given (as in free) to all cable systems who will carry the channel and it makes money by charging those who put programming on the service, plus, it accepts advertising. SPN goes into cable homes free of any charge to cable system operators. Logic suggests that SPN should also be a 'free' service for non-cable homes; i.e. direct reception home terminals. Now SPN is notifying home terminal operators that they are ''not currently granting permission to home terminal viewers to watch their transponder''.

The programmers who buy time via SPN to go into cable homes want the biggest possible audience for their programs. The advertisers who buy time on SPN also want the biggest possible audience. Why then is SPN not accepting private home terminal viewers?

The answer is complex. SPN circulated a form to all of their programmers last summer asking these programmers if they objected to having their programs distributed via SPN to (1) MDS systems, (2) MATV systems, or (3) private home terminals. Six of the present programmers on SPN responded that they did object to having their programs shown through SPN on MDS systems, MATV systems and to private terminals. Why? Because these programmers have entangled copyright agreements whereby they are actually prohibited from distributing their programs directly to viewers who are not inter-connected to SPN via cable hookups. The world of copyright agreements is complex, often contradictory, and always confusing. When somebody produces a program, they often assign certain distribution rights to a second or third party. These distribution right assignments are usually assigned for monetary reasons; company 'X' agrees to put money up for company 'Y' to produce a program series, provided company 'X' gets a little spiff. The 'spiff' is that company 'X' gets the exclusive right to distribute the program to TV broadcast stations or to home viewers. Company 'Y', the program producer, retains the right to distribute the program to cable systems. Often the newer technologies such as MATV distribution (fed via satellite) or MDS distribution or direct-home-TVRO terminals are never mentioned or included in either firm's distribution agreement. And because it is **un**specified, company 'Y', distributing the program via satellite and SPN to cable systems is precluded from granting that permission to SPN to serve MDS systems, MATV systems or private home terminals.

SPN has been accepting MATV system users but only after the MATV system has agreed in writing that it will 'turn off' SPN during those periods of the week when the six programs are being transmitted via SPN. MDS systems are in the same boat as private home terminals; their legal status as quasi-common-carrier broadcasters is under such a milky cloud these days that SPN and the SPN program suppliers simply don't want to mess with them.

SPN would like to be able to authorize home viewers to use their transponder 21 programs within the home. But SPN programmers are unable (or refuse) to allow home (private terminal) viewers. Once again the ugly head of copyright rears itself in the painful development of private home terminal viewing.

Is there a solution to this impasse? Currently Satellite Television Technology is one of the SPN programmers with our weekly 'Satellite Magazine' program each Thursday. **We grant** letters of permission for viewing our program on SPN and we suspect that many of the other SPN programming sources would do so as well if they had some way to handle the paperwork. We are working on this and we'll have more to say about it as we sort it all out.

RCA III DISAPPEARS

During a December 10 apogee kick motor firing RCA's FIII satellite disappeared. The kick motor firing either blew up the satellite, turned it over, or caused an electronic failure on board. RCA and NORAD will continue the search until around January 1. If not located and re-captured, the next launch date would be in 1981. **Some** of the FIII services planned may be fitted onto FI. Full report February and on **Satellite Magazine** January 3 and 10.

CSD

PROGRAMMING

COOP'S SATELLITE DIGEST (Programming Edition) is produced monthly by Satellite Television Technology, P.O. Box G, Arcadia, Oklahoma 73007 (405-396-2574). CSD is available in two separate editions (Programming and Technology) or as a combined subscription. Subscription rates are $30 per year for first class mail delivery within U.S.A. or Canada for either edition, or $50 per year for the combined editions. Outside U.S.A. or Canada add $25.00 per year for any subscription. All subscriptions to be paid in advance in U.S. funds drawn on a U.S. bank; no invoicing.
Contents are Copyright 1980 © by Satellite Television Technolgy and any duplication or reproduction in any form without written permission is a violation of Federal Statue (17 USC 101 et seq.).

LICENSING CATV SYSTEMS

WHICH WAY IS UP?

The primary premium cable programmers on the satellite and some of the common carrier services offering up the nation's leading independent television stations say they cannot deal with the ''private'' or ''individual'' satellite home terminal viewer because either their program supplier agreements or the U.S. Copyright Law prohibits them from doing so. Other satellite delivered programming sources, such as ESPN, have reacted to what is apparently cable industry pressure and raised their 'private' viewer rates from miniscule to astronomical levels (see separate report this section of CSD).

On the surface it is beginning to look as if many of the satellite program services don't want private home terminal viewers on their books. Is that really what it is all about? And is there a way out of the quandry?

At SPTS '79 in August there was only a single premium service (HBO) which was in public refusing to accept private (home) terminal agreements. And only one common carrier indie service signal was also not accepting private agreement. Most observers predicted that given time HBO and Southern Satellite would see the handwriting on the wall and begin accepting private viewer contracts rather than simply refusing the service and encouraging by their refusal the piracy of their services.

Then in mid-fall the change came, only it went in an entirely different direction than had been forecast. SHOWTIME, which **had been** accepting private terminal viewers, joined the ranks of HBO; and Warner Cable for a number of reasons took KTVU off the market as an 'available indie' for hire. And then the champion of low cost satellite entertainment, ESPN, began advising interested private viewers that the rate was now $100 rather than the nominal cable-TV-operator $1.40 lifetime rate.

Some obvious pressure is at work here. Where is it coming from? The answer is 'the cable TV industry'.

Cable has a golden goose in the sky. With its own satellite(s), cable has programming simply not available to people any other way. Cable systems thrive and grow simply because they have optional, not-available-anyplace-else programming. **Cable sytems want to keep it that way** and the larger cable operators see **home viewing** of satellite as a threat to **their** future growth. Just as broadcasters one day in the not too distant past attempted to keep their exclusive hold on viewers by getting the FCC to adopt complicated ''cable signal carriage rules'' intended to keep ''foreign programs out of their service areas'', cable firms are now showing their muscle to the satellite program suppliers and quietly letting these suppliers know that if they go out and sell their services ''**directly**'' to the public, without going through the cable ''middleman'', that the program suppliers are apt to lose their middlemen's bulk business.

Cable TV systems represent hundreds and thousands and in some instances hundreds of thousands of paying customers. It is not unusual for one cable conglomerate to add (or subtract) 200,000 or 400,000 or even 800,000 viewing homes to a satellite service with a single contract. Home viewers represent at most a few thousand dis-associated viewers with no such contractural power and even if the home viewing service grows dramatically in 1980 and 1981, it cannot approach the impact of a handful of large cable system group owners sitting down with a supplier and threatening to boycott his services. The handwriting is clearly on the wall.

THE WAY OUT?

You've seen the shops with signs that read 'Wholesale Only'. And there you stand outside their door with a pocketful of money, the desire for their merchandise, but no way they will sell it to you.

The answer may be that you become a wholesaler yourself. You might even make some money at it. Let's see how that might work.

There are two categories of satellite programmers of interest to us:

1) **The program service suppliers** who themselves contract for the transponder time (space) and for whom there are no formal FCC rules, regulations or provisions. HBO, SHOWTIME, The Movie Channel (formerly STAR Channel) plus Nickelodeon, ESPN, C-SPAN, Madison Square Garden Events, Trinity, SPN, PTL and CBN make up this group at the present time.

2) **The Common Carrier companies**, operating with on-file-at-the-FCC tariffs who largely bring to satellite off-air received broadcast signals. Southern Satellite brings up WTBS this way; Warner Cable Communications KTVU, United Video's WGN and Eastern Microwave's WOR complete this set.

The first group of suppliers can create their own rules, their own contracts, and conduct their business affairs pretty much as they see fit. They have only a handful of FCC (technical) rules to abide by and no real rules governing how they can or must conduct themselves in the marketplace. In effect, HBO can say to you ''Yes, I want you as a customer'', or alternately ''no, I don't want you as a customer''.

The second group of suppliers establish their own rules but they must get FCC approval for the way they offer their services to potential customers, how much they charge for their services, and how they treat their customers. In fact, if a

qualified customer comes to Southern Satellite asking for WTBS service and Southern refuses to deliver that service (or in the case of satellite reception, authorize use of that service) the 'qualified' customer has the right to go to the FCC and complain about Southern's handling of potential customers. Southern (and any other common carrier) runs the risk of losing their coveted FCC granted common carrier license if they (for example) refuse service to a qualified customer.

So how do **you** become a qualified customer? That's what this is all about. To explore, prior to Miami's SPTS '80 (where the subject will receive considerable panel discussion), just what an individual home viewer can do to get the program suppliers on the bird to sell him their service.

JOIN THEM

If you can't beat them,join them.Become a qualified buyer (at wholesale yet!) of the services they have to offer. It is not as if the various program suppliers don't want your money; they just don't want the hassle of having to keep special books for you when you are not part of the present cable game plan. Simply put, become a cable system. OK, what is a cable TV system?

Well, that depends upon whom you talk to. Way back in 1972 the FCC adopted some very complicated rules regarding what a cable system is or is not. And if you are one, what you can and cannot do. Let's go to the FCC rules to see how they define a cable television system at the Commission:

76.5 Definitions

[a]Cable Television System (or CATV system): **Any facility, in whole or in part, receives directly, or indirectly over the air, and amplifies or otherwise modifies the signals transmitting programs broadcast by one or more television or radio stations and distributes such signals by wire or cable to subscribing members of the public who pay for such service, but such term shall not include** [1] **any facility that services fewer than 50 subscribers, or** [2] **any such facility that serves only the residents of one or more apartment dwellings under common ownership, control, or management and commercial premises located on the premises of such an apartment house.**

Later ''clarifications'' of this ruling added condominiums (where 49 or fewer were in a common system) to the exempt list and trailer courts (where 50 or more trailers were hooked to a common system) became officially in FCC eyes ''cable systems''.

Well now, that seems clear enough. If you create a cable service and it does not have **50 or more** subscribers, the FCC doesn't recognize you as a **regulated** cable system. Or, if you have 100 subscribers but ''your cable service'' only carries HBO, Nickelodeon and C-SPAN, they don't define you as a cable system simply because the services you are carrying do not include ''one or more television or radio stations''. On the surface, **not** being regulated by the FCC would seem to be a worthy goal. We'll return to that point shortly.

The FCC is not the only Washington agency that has an interest in defining cable systems. The Copyright Office is another agency with such an interest. For back in the fall of 1976 President Ford signed Public Law (PL) 94-553; a law that substantially revised and updated the 1909 Copyright Law and cable television played an important part in the final form of this new law. Until this law was signed cable television systems were ''exempt'' from paying copyright use fees for the television programs which they pick out of the air and deliver to cable customers.The Copyright Lobby was sufficiently influential to get the law written in such a way that now if a cable system operates it must pay at least a token fee to the Copyright Office on a semi-annual basis for the ongoing rights of ''secondary transmission use'' of broadcast television signals. Under the law, cable systems pay into a special fund collected and administered by the U.S. Copyright Office, and all persons, firms or others who create original-for-television programming are entitled to make a ''claim'' against that fund on an annual basis as ''payment for their creativity''. The language of PL 94-553 makes no distinctions as to system size. In the eyes of the Copyright Office, a cable system is exactly as the FCC defines it **only** there are no exemptions for size. In theory even a chap with a huge private TV antenna who hooks up a **single neighbor** for pay is a cable TV system for copyright definition purposes.

And that seems clear enough. You can hook up as many people as you wish for free, but hook up the first one for payment (of any kind) and the U.S. Copyright Office wants you to follow the rules of PL 94-553. We'll see what those rules are shortly.

So much for the federal definitions. Now what about state or local definitions? Some states have extensive cable ''regulatory'' acts on the books. New York State, for example, has a commission to ''regulate'' cable and a set of rules second only to the FCC rules. Most such states however follow the FCC's exemption process, excluding from regulation those systems with fewer than 50 subscribers. And state regulation is still the exception, not the rule (i.e. more states do not have cable regulation on a state level than do).

DEALING WITH COPYRIGHT

If you intend to carry one or more broadcast television signals to one or more paying viewers, you must register your ''cable television system'' with the Copyright Office (Washington, D.C. 20559). There are no registration forms available, you simply write a letter that includes the following information:

1)The name of your cable system;
2)Tell whether you are an individual proprietor, a partnership, a corporation or other (explain) other);
3)Give your full mailing address;
4)Name your community you will serve and if a portion of a community, so indicate. If only a rural area not incorporated, give a description of the area you will serve (i.e. ''one square mile centered on the corners of Redbud and Harvest roads...'').
5)List the call letters and city of license for **all** TV and FM and AM **broadcast** stations you intend to carry on your system.
6)Type or print your full name and your title, and sign the letter.

Headline the above letter ''Cable Television Initial Notice of Identity and Signal Carriage Complement''. Do **not** list non-broadcast signals you will carry (i.e. any satellite services not broadcast via regular broadcast stations).

There is a flat fee for all cable systems which gross less than $80,000 per year. Chances are this will include you. **That fee is $30 per year** and is paid on the basis of twice per year (they'll let you know about this when they respond to your initial identification letter). Copyright fees for cable systems that gross over $40,000 per six months ($80,000 per year) are quite complicated and you can worry about that when you get there!

There **is** one exemption to Copyright payments worth considering. If you carry **only** local (Grade B or better contour) off-air signals, but to that you add one or more of the **non**-broadcast satellite signals...and you make no direct charge for the 'MATV' service, you **are** exempt. An MATV system is defined as a 'master antenna television system' such as you find serving rooms in a motel or an apartment building. Note however that if you charge for the (MATV) service you are no longer exempt. Could you 'give away' the local broadcast signals and charge only for the satellite delivered **non**-broadcast signals and avoid the copyright folks? The answer is yes; the Copyright Act addresses ''re-transmission of (**distant**) broadcast signals'' and if you stick to local broadcast signals you can charge not for them but for the distant non-broadcast signals and avoid the copyright mess. But be sure every subscriber to your service signs a contract which clearly states that this is the case!

What about local regulations? This falls into two areas; incorporated areas and non-incorporated areas. The key word is "franchise". A franchise in most states is nothing more than the authority of the local governing body (city council, county commissioners) allowing the cable firm to "utilize the streets, alleys, byways (etc.) and other public easements to string cable and install amplifiers and other equipment". In other words, it is a permit to do business and such a "franchise" is often in lieu of a city business license. In a few states (Iowa for example) a "franchise" means more than that and it requires the approval of the local voters (referendum) in an incorporated community. You need a franchise (or permit) to use the **public** easements but you do **not** need any authority to utilize **private** easements other than the permission of the property owners who's land you will cross. This says that if you can avoid crossing over any streets and avoid using any existing utility poles to string your cable, you don't need city or county permission. You simply reach agreement with each landowner whose land you will cross and put in your cable and equipment. If you must cross a street or two there are several options available.

1)Ask for a **'restricted franchise'** from the city or county that specifies the exact service area you will cover, making note that your service is not intended for the whole community but rather is for 'local' distribution only, or,

2)Don't ask for a franchise; simply ask the city for a **"street crossing permit"** for a **"closed circuit RF distribution system"**. In other words, don't make a big deal of it, keep it low key, and go to the appropriate city department asking for just specific street crossing permits where you require them to get from one block to another. If you **avoid** the use of phrases such as "pay cable" or "cable TV" or "premium television" chances are your permits will be granted without much hassle or attention.

In the latter case you are simply asking city or county permission to cross some public streets with a "coaxial cable" which you intend to "interconnect from your house (office, etc.) to several 'friends' who live nearby to you". What will you transmit through the coaxial cable? If they ask, explain that you are experimenting with satellite reception and you wish to share the reception with others. And be quick to explain that your system will be operating under the rules and regulations of the Federal Communications Commission and that it won't cause any interference with anybody else's electronic receiving equipment; it is merely a "receiving system".

Of course a person could get across a public street without a permit; in fact in some states such as Texas, unincorporated areas (i.e. within the county) are precluded from granting either (cable TV) franchises or street crossing permits. But there is one more hurdle to cross which makes the "street crossing permit" or "limited area franchise" almost mandatory; the utility company rules.

Most small systems will find that the least expensive and least troublesome method of getting from point 'A' (your headend) to points 'B', 'C', etc. will be to attach your cables to the existing utility poles. Because of the growth of cable TV, utility firms now readily grant you such permission under annual rental agreements. For a fee (it varies from under $2.00 in rural areas with REA poles to over $12.00 - per pole per year - in other areas) they will allow you to attach your pole hardware and cable to their poles. BUT - in almost all instances they will not sit down and talk with you **until** you can demonstrate that you have all applicable local permits (easements, street crossing agreements) in hand. Again, keep it low key and act like your request is only for a small experimental project. Don't make the mistake of calling it a cable TV system; just yet!

Once you have the street crossing permits, easements where required and an agreement with the utility company, you are then ready to start stringing cable. But are there options to all of this?

Of course you could stay within one block (crossing no streets, or if you are in Texas cross streets as you wish in unincorporated areas) and lay your cable in such a way that it does not have to be **on** utility poles. You could bury your cable (Ditch-Witch and other rent-able pieces of equipment can bury several thousand feet of cable per day), again with permission of anyone who's land you cross. If you bury you have a new problem when crossing a street. There are two options:

1)Come back up above ground and use poles to cross,

2)Bore under the street.

Various classes of streets have different crossing-height requirements. A normal secondary street requires an 18 foot crossing height (your cable above the crown of the roadway). Interstate and other highways are often 21 feet while railroad crossings are a special case with 24 (and higher) clearances required. Boring under the street can be done with rented equipment but it is dangerous if you are inexperienced since you may well run into something under ground such as gas or sewer pipes. A better option might be to hire it done by a professional company engaging in such work, typically at a rate of $3 to $5 per foot. Again, crossing a street (even under) requires a street crossing permit in most areas.

WHERE ARE WE?

The FCC says you are exempt from their regulations if your "cable TV system" has fewer than 50 subscribers. **Indirectly**, they still regard you as a CATV system however. The Copyright Office says as soon as you connect one paying subscriber to your 'system' you are in their eyes a cable TV system. However their provisions only apply to your carriage of "broadcast TV signals" and if you **avoid** carrying satellite signals that **are broadcast signals** (KTVU, WGN, WOR, WTBS) and also avoid carrying any other (local) broadcast signals, they don't want to hear from you.

Some states regulate cable TV but apparently without exception you are exempt from their rules if you don't carry broadcast TV signals and in most such states you are exempt if you have fewer than 50 subscribers.

Local laws govern use of public easements for stringing cable (and other equipment) and most utility firms won't negotiate a pole-use-contract with you unless you have local permission to use these easements. By staying within one block (or in states such as Texas staying in unincorporated areas) you can avoid this hassle. In Texas (and possibly other states) the unincorporated areas require no easements and you can deal with the utility firms without an easement.

If you intend to have 50 or more subscribers at some point, that's another can of worms which we'll discuss in a future edition of CSD.

THE PROGRAM SUPPLIERS

The common carrier services (KTVU, WGN, WOR, WTBS) are **required** to provide service to you if you are willing to pay their rates and if you are a qualified user. You can be a qualified user if:

1)If you are a cable television system with paying customers, and if

2)Your cable system is operating in compliance with local regulations (if there are such regulations).

The independent signals available via satellite are 'tariffed' pretty much alike; in the small system category it

MAKE INTELLIGENT PROGRAMMING DECISIONS...
...with SAT-Guide

Twenty channels of programming today on FI, soon 35 on FI and FIII. Keeping up with what is 'up', when, is almost impossible. Until SAT-Guide.

ALL FI programs on **all** transponders are listed in this unique programming guide to satellites. INCLUDES daily program listings PLUS monthly summaries of movies, sports and specials. Only $28 per year from:

SAT-Guide P. O. Box 1569
Division of Commtek Hailey, ID 83333

costs you $.10 per cable subscriber per month with a $5.00 monthly minimum (equivalent to 50 subscribers), paid annually (in the smaller ranges) in advance. Bottom line? We'll get there.

The other services can take you **or** leave you alone; there are no rules which state that HBO (et al) **must** accept your order or request for service. There are extensive 'affiliate contracts' to be signed for all premium services. HBO's is by far the most extensive. Among other things it states:

1)The affiliate shall not offer another programming channel **packaged with HBO** for a premium service charge, unless you have the permission of HBO to do so.

2)The affiliate shall provide the earth receiving terminal, and must warrant in the contract that the earth station meets all applicable laws, regulations, procedures and orders for all bodies having jurisdiction over same.

3)The affiliate must have the capability of switching his HBO receiver to another satellite transponder in the event of failure of the primary transponder.

4)The affiliate warrants that it shall take all necessary, appropriate and reasonable precautions to prevent the reception of HBO premium programming by any party who is not an HBO subscriber.

5)HBO (et al) say you cannot supply HBO service to any establishment which ''charges an admission fee, cover charge or 'minimum' ''. Likewise, premium service programming cannot be displayed in any commercial or non-residential building including bars, restaurants, hotels, or fraternal organization or in any 'communal room' in a residential building such as the lobby or social room of an apartment house or college fraternity house.

6)Affiliates shall not permit and shall take all necessary, appropriate and reasonable precautions to prevent any use, copying **or taping** of any part of the HBO service.

7)Affiliates shall (at its own expense) select, purchase, install and maintain in good working order equipment which (to the extent reasonable for the state of the art) will ensure that the HBO service will be received only by HBO subscribers who pay for this (supplementary) service.

8)Affiliates must use their 'best efforts' to maintain a high quality signal for the HBO programming channel ''at least equivalent to the transmission quality of the other programming provided by...the cable television system''.

Premium programming wholesale rates vary slightly from firm to firm. For example:

HBO: They want a minimum of $3.50 per month per premium service subscriber, and if the cable system gross for the service exceeds $7.00 they want 50% pf the gross up to $8.50 per month and 30% of everything above $8.50 per month. There are small discounts for large buyers starting at the 10,000 subscriber level.

SHOWTIME: They have a more flexible rate schedule that falls more or less in ''competitive line'' with HBO.

The Movie Channel (formerly STAR Channel): They have a flat fee of $3.75 per month but have until **this** month 'thrown in' Nickelodeon as a bonus.

WHICH LEAVES YOU

There are several options open. If you elect to be a cable system with fewer than 50 subscribers:

1)You are free of FCC rules, but,

2)If you carry **any** broadcast signals (including the satellite signals from WOR, and/or WGN, and/or WTBS, and/or KTVU, and/or others that may be added such as Boston's WSBK) you must register with the Copy Office (see separate material in this report). And you must file semi-annual payments with the Copyright Office. If you carry **any** broadcast signals, the FCC rules state that you are supposed to also carry **all** local' signals as well (i.e. those with a Grade B or better contour over your area).

3)The common carrier services are required to provide you service although it may be costly on a per-subscriber-basis per year until you reach the 50 subscriber or so level (recall that there is a minimum charge of $60 per year).

4)If you are doing these things, the chances are quite good that **at least one** of the premium programmers (The Movie Channel most likely) will deal with your 'very tiny' cable system on a contract basis.

Of course you'll have to obtain local permits as required but at least you don't need a TVRO license any longer since the FCC lifted that rule on October 18th.

If you elect to be a non-cable system (i.e. carry **no broadcast signals** at all), you can still carry ESPN, PTL, CBN, Trinity, Nickleodeon, one or perhaps more of the premium service channels (and others now coming on that are not broadcast signals) and avoid the FCC and the Copyright Office. However in so doing you may also cast some doubt in the minds of the premium programming suppliers unless you are willing to deal with The Movie Channel since they have been more flexible than others to date (accepting private residence viewers for example). A new non-cable cable system in Arkansas recently started up in a fair sized community in this manner, carrying 12 signals none of which are broadcast television!

There is no way that this brief synopsis could cover all of the problems, possibilities or contingencies of getting into the local re-distribution of satellite received signals. However this should provide you with a starting place and from feedback from you future reports will be created to attempt to answer your questions and plans.

FCC DEREGULATION PHASE II DISCUSSION SECTION 605

WHERE DO WE STAND?

In their decision to de-regulate receive-only earth terminals this past October 18th the Commission's actual discussion of Section 605 largely skirted the issue of how the regulatory body intends to implement Section 605 in the new regulatory scheme of things (see **CSD** for December, pages P2-P7). Subsequent to that open hearing the Commission's staff prepared a lengthy (19 page) document released on November 7th addressing the fine print language of the action of the 18th. As is often the case the Commission's printed release not only covered the action more extensively than the oral discussion, but it dealt with matters not even discussed in the actual session.

The purpose of such a document is to establish a record and close loopholes in the general theoretical approval of the full Commission. Matters such as the de-regulation of earth receive terminals often begin outside the Commission and are then initiated within the Commission by the Commissioners. At that point the staff picks up the ball and does the extensive digging required to prepare the matter for the Commission's agenda. After the item appears on the agenda the staff goes back to work preparing a detailed document on the item. This document is circulated (as a rule) to each Commissioner's office where legal and technical aides to each Commissioner go through the document. Refinements added, the document finally is released and it (as opposed to the oral discussion

before the full Commission) becomes the 'legal record' for the item.

The November 7th release (1) talks a great deal about Section 605, what it means, and where the Commission stands on this issue today. CSD has carefully reviewed the release and talked with several people at the Commission about the next step in the "605 clarification matter". Yes, that suggests there is (much) more to come on this issue.

In the November 7th release the Commission noted:

"**Discussions related** to whether or not Section 605 of the Communications Act...requires continued regulation of receive-only earth stations figured prominently in many of the comments received. Some parties argue that licensing is necessary for enforcement of Section 605 since threat of revocation of the station's license is an effective deterrent to violation. Those parties raise the specter of theft of signals and argue that this is a significant problem which any form of deregulation would tend to encourage.

"**Some of the parties** felt that more stringent regulation was called for...believing that additional information with regard to the programming which the individual operator had permission to receive would be helpful to enforce Section 605.

"**Two additional disadvantages** of optional licensing (related to Section 605) have been advanced...first that the option of revoking an operator's license must be maintained as a means of enforcement of Section 605...second that if licensing is made optional...the Commission must, at the very least, maintain a central list of all station locations and programming (which they are authorized to carry/receive)."

The Commission responded to these assertions with:

"**We reject both of these arguments**. We note (that Section 605) prohibits the unauthorized interception and disclosure of radio communications (and this law)...is applicable to domestic U.S. satellite transmissions except those that may be designated 'broadcast for the use of the general public'."

"**It is well recognized** that the purpose of Section 605 is to 'protect the integrity of the telecommunications network'. Domestic satellites are a part of the modern telecommunications network and all existing satellites have been designated as 'fixed' (satellites), **not broadcasting satellites**. Signals transmitted over existing domestic satellites are radio communications intended for a specific audience, not for the general public. Hence we conclude that the protections of Section 605 remain applicable to existing domestic satellite communications. We believe...that licensing is not an effective means of enforcing Section 605. Moreover, there is no evidence to suggest that the threat of revocation in itself is a significant deterrent. Civil remedies may accrue from violations of Section 605 and Federal Copyright Laws are applicable to much of the material carried via domestic satellite. (In addition), some provisions of the 1968 Omnibus Crime Control Act make **the mere interception** of protected communications a federal crime and may afford a special civil right of action. Furthermore, our other administrative remedies include imposition of forfeitures or issuance of cease and desist orders. Moreover...programming parties have the option of scrambling the signal transmitted and thus making unauthorized reception and use more difficult.

"**We wish to emphasize** that we are concerned about illegal interception of common carrier transmissions...**we will address Section 605 in a proceeding on communications privacy which the staff is preparing...**".

Well, for now that seems pretty clear. In the Commission's view **both** interception **and** disclosure of radio communications is prohibited. The Commission maintains that even signals 'broadcast for the use of the general public' (i.e. WGN, WOR, WTBS, and KTVU as now carried on SATCOM) are in fact 'protected' by Section 605 since the satellites themselves are licensed as 'fixed' stations in the common carrier service; not as 'broadcast stations' (satellites). By that interpretation **any** transmissions passing through a station (**i.e. satellite**) licensed in the 'fixed' service are private in nature.

Fred Hopengarten and others have maintained that **the mere interception** was not illegal (see **CSD** for October 1979 and **QST** for January 1980; 'The New Frontier'). The Commission plainly disagrees. Hopengarten, as reported in the October **CSD**, seeks a formal FCC action on this point; he has requested that the Commission prosecute him and one of his (California) installations as a test of the Commission's authority here.

Section 605 has been little tested and not well understood from its origins. Perhaps it has been little understood primarily because the Commission itself has spent virtually no time either explaining it or enforcing what they **believe** it says. We noted that the Commission has asked 'the staff' to prepare a 'proceeding on communications privacy'. **CSD** finally ran down Russ Frisby, an 'attorney-advisor' with the Policy and Rules Division of the Commission who has been assigned to this proceeding. Frisby admits he is heading up this activity but suggest "...at the moment we are just looking into some privacy issues to try to make some determinations as to what proceedings we should initiate to look into...".

Frisby notes at this point he does not know whether this proceeding will end up being a Notice of (new) Proposed Rule Making, a 'Clarification' of the existing rules or a re-statement of Section 605 'policy'. "At this point we have been looking through a number of complaints that we have received". We asked if the areas being investigated by Frisby and his people were going to be 'limited to satellites'. "No, we are not going to be limited to satellites. One of the things we hope will come out of this will be a clear explanation of Section 605; but as I said we are just beginning...".

Have there been through the years any noteable FCC actions regarding Section 605?

Frisby says "Not really. What we have done is issue a few notices; we had a 'Satellite Notice' (in the summer of 1978) and a 'MDS Notice' (in the winter of 1979). That has been the extent of our activities. In the late 60's the Commission had some correspondence with Lafayette Radio regarding a (subcarrier FM) receiver which they were making. However nothing ever came of that (in a legal sense) because Lafayette decided to drop the product voluntarily from the marketplace."

We pointed out that Lafayette may have been the largest marketer of such (FM) subcarrier receivers (at the time) but that since that decade old exchange of correspondence other firms have continued to manufacture and distribute such FM adaptors. Frisby notes "I think they are doing so out of ignorance of the rules or out of poor interpretation of what Section 605 means". In the Commission's view subcarrier FM transmissions (MUZAK, etc.) are protected under Section 605 and you are not supposed to be tuning in such transmissions without the permission of the operator of the system.

What about scanner radios? Here we have millions of radios widely marketed and expressly designed for the interception of 'private' (i.e. Section 605 protected) business, police, fire and other public safety and telecommunication transmissions. They are designed by intent to allow people to 'eavesdrop' (to use the Commission language).

Frisby notes "Again, that is something we really haven't dealt with. We did have occasion in the early 60's to issue a Public Notice reminding especially (FCC licensed) broadcasters that they couldn't listen into a police or fire or whatever transmission and then use it for broadcast purposes. But we have never really had to face that issue".

Apparently that early 60's Public Notice didn't make a very big impact; you can walk into every radio, television or newspaper newsroom in the country and find one or dozens of 'scanners' grinding away from channel to channel to give the newshawks a head start on getting their reporters to where the action is happening!

Will this 'proceeding' look into or address the reception of **non-U.S. satellites** by U.S. satellite terminal operators? We wondered about the Commission addressing the legal position

---

1]For those who might like to attempt to obtain a copy of the November 7 release it is captioned "In The Matter of Regulation of Domestic Receive-Only satellite earth stations; CC Docket no. 78-374", FCC 79-665 14953 from the Federal Communications Commission, 1919 M Street NW, Washington, D.C. 20554.

of individuals receiving transmissions from ANIK, or INTELSAT or the (Russian) STATSIONAR birds now in the sky and 'visible' from many U.S. locations.

Frisby responded "It probably will not deal with that, although as I said we are just beginning to focus on the areas to be addressed here...".

The Commission in their November 7th formal written statement **did have** a couple of things to say about accessing non-U.S. satellites. The language does not give one an altogether 'clear' image of their present position (i.e. interpretation of their authority), perhaps because of semantic difficulties. For example, they noted:

"(The deregulation of receive only terminals, or optional licensing)...does not extend to INTELSAT facilities since additional regulatory responsibilities are imposed by the 1962 Communications Satellite Act on (such) receiving facilities... and we propose no changes whatsoever with regard to procedures for regulating those facilities."

"...any deregulation of receive-only earth stations does not imply permission to receive service from non-U.S. points. Such permission can be provided only after the discharge of our treaty obligations to INTELSAT. (Therefore), until such permission is granted any reception of non-U.S. signals is unauthorized and subject to the sanctions of Section 605...unless specifically authorized".

Apparently the Commission is telling U.S. receive terminal operators that they are not to tune in transmissions from non-U.S. domestic satellites (i.e. such as ANIK) nor from INTELSAT satellites (by name) without the written authority of INTELSAT. Not covered (because they overlooked it, or, on purpose) is reception from **not**-domestic, **not**-INTELSAT satellites such as the Russian STATSIONAR series of satellites (as reported in the December **CSD**, Statsionar-4 is now up and operating at 14 degrees west and puts a signal into the eastern 40% of the U.S. on 3845 MHz among other channels). Note that the Commission also re-affirmed the prohibition against U.S. DOMSATs providing service **to non-U.S. points** (such as Mexico, Canada, etc.). This prohibition has stood since the earliest users of DOMSATs emerged although it is hardly a matter for U.S. enforcement since any enforcement would have to be through the government of the country where the 'offense' is taking place.

Frisby notes "It is not likely we will deal with this in the projected proceeding; quite frankly we have enough problems at home!". The Commission did note in their November 7th release why they feel they cannot at this point in time deal with the reclassification of all U.S. domestic satellites operating in C band (3.7 to 4.2 GHz) from 'fixed' to 'broadcasting'.

"(Such a redesignation) is not feasible because the satellites operate in (a band) which is allocated to the Fixed Satellite Service in both the domestic **and** international tables of frequency allocations. Thus transmissions in this service must be between specified fixed points even though (as a matter of practicality) there is no limit in the number of such (fixed) receiving points. Therefore the prohibitions of Section 605 and Article 17 of the International Radio Regulations on the unauthorized reception and use of non-broadcasting radio transmissions are applicable. To permit the use of domestic satellites for reception by the general public, i.e. as broadcasting satellites, would have far-ranging domestic and international repercussions and is clearly beyond the scope of this proceeding."

WHICH SAYS...

...that if you wish to continue to operate your own private domestic satellite receive only terminal you should have the **written permission** of at least one program supplier on the bird(s). A listing of those services which grant such permission (in several cases without any fee being paid) appeared on page P6 of **CSD** for December. Satellite Television Technology continues to grant letters of permission for viewing of our weekly 'Satellite Magazine' program which is transmitted on Thursdays at 12 noon eastern on SPN transponder 21.

And this final note. Inspite of the Commission's statement that "the staff is now working" on the 'privacy matter' and frequent statements by Commission personnel that such a document (under Frisby's direction) will be coming out 'soon', we got the distinct impression that such a document may well be in the mill through the end of the first quarter (i.e. end of March) if not in fact beyond. When it does 'ripen' for release, we'll again take up this issue here in **CSD**. In the interim, you now know as much as anybody does about this matter and more than most!

SATELLITE TV EXPERIMENTERS
INTRODUCING A COMPLETE
3.7 — 4.2 GHz DOWNCONVERTER
•3.7-4.2 GHz in, 70 MHz out
•Remote, one control tuning
•Dual conversion ble
•Assembled Only $895.

Polar Mr te Feed Rotation
Dish.
SU stpaid

EXPER UPPLIES
•Teflon PC B stant 2.55
1/16''x9''x3''
1/32''x9''x4''
•Chip capacitor ! 18, 27, 39, 220, 4700 pf.
•SMA and microwa uire
•2''x14'' copper tub 3 lbs. $12.00

THIS PRODUCT NO LONGER AVAILABLE

WRITE - We are adding to our inventory!

SATELLITE INNOVATIONS
P. O. Box 5673
Winston Salem, N.C. 27103

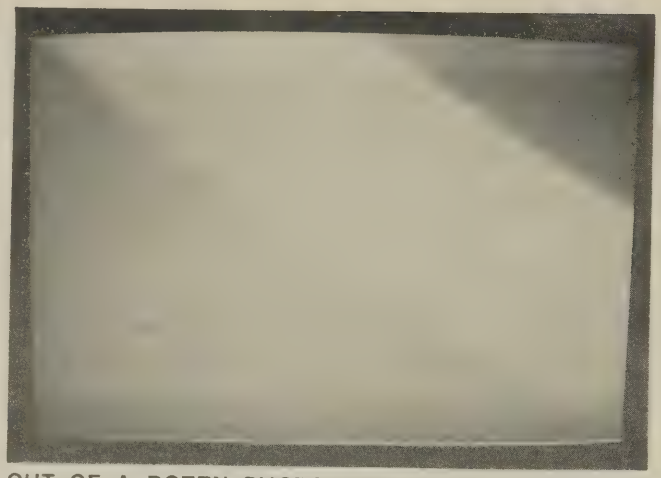
Add $2.00 shipping and handling (except for plans)

VIDEO PICTURES FROM SPACE MYSTERY

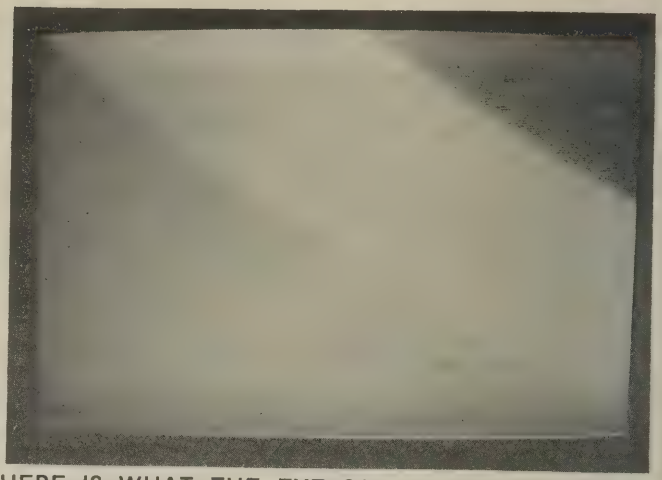
A MYSTERY?

You never know what you will tune in on the satellite services. And sometimes what your eye sees is not what is there at all!

Case in point. Back in February of 1978 on RCA SATCOM FII (when this bird was the primary cable TV bird; cable services moved from FIIto FI in June of 1978) RCA was doing a



OUT OF A DOZEN PHOTOS - 11 turned out this way. Depicting exactly what the eye saw [plus the diagonal effects of the camera's focal plane shutter].



HERE IS WHAT THE EYE SAW - a grey screen, no modulation evident, filling the upper approximately 80% of the screen.

great deal of 'experimenting' with various transponder loadir. formats. One of the favorite test formats of that era involved turning on the 30 Hz energy dispersal waveform and running what appeared to be an unmodulated carrier through the transponder. To the eye it appeared as photo one here ; a blank (grey) screen that filled the upper approximately 80% of the CRT with a clearly defined thick black band at the bottom of the CRT display.

In photos one and two here we see what it looked like to the eye. The upper left to lower right diagonal shading is a result of the 35 mm camera's focal plane shutter apparatus; to the eye the screen display was an even shade of grey from left to right and from top down to the black display at the base.

During one such testing sequence a 35 mm camera was set up and a series (approximately a dozen) of black and white photos were taken. For the uninitiated, you can take fairly high

BUT ONE PHOTO DISPLAYED WHAT THE EYE DID NOT SEE - this unexplained video that sill has people guessing as to what it is and why it showed up in the photo when the eye saw nothing. Perhaps this is the ultimate 'scrambling' system!

quality black and white or color photos off of the CRT by following these steps:

1)With a 35 mm camera, having adjustable F stop and speed controls,
2)Set the speed to 1/25th or 1/30th of a second (to correspond to the frame rate of 30 per second),
3)Adjust the monitor display for a normal display, slightly harsher contrast than you might normally adjust for viewing (but just slightly),
4)Hold the camera very steady, or mount it on a tripod and get in as close as you can and still focus the full CRT display in the viewfinder,
5)Set the aperture to f4 through f5.6 if you are utilizing Tri-X (ASA 400) 'fast' black and white film (f2.5 through f5 for slower color films),

and take your picture. In the case in point this is exactly what was being done; the non-video display was up on transponder 16 and the camera was manually operated for about a dozen shots of the seemingly uninteresting 80%-of-screen grey display you see.

Then the film was developed and much to everyone's surprise one of the photos developed and printed did **not look** like the display the eye(s) had seen. In fact it looked like nothing any of the observers had noticed at the time, prior to the event or subsequent to the event. See photo three here.

Several dozen people including engineers at RCA have viewed this photograph. The roll of film in question was developed and printed by a custom developing house where CSD (CATJ) photos have been handled for years. The individual doing the work was the same individual that had been doing the work all of those years. The image you see on the print is an exact replica of the image seen on the negative. This particular shot out of a group of 12 was number 8 and those immediately ahead of it and immediately after it are 'normal' in respect to showing the same 80%-of-screen grey display which the eye saw.

RCA people who have been shown the photograph (at the Vernon Valley uplink site) have offered absolutely no explanations. Western Union engineers at the WU Vernon Valley uplink site similarily have had no explanations. The exact date and time of the photographic sequence was not recorded since there appeared to be nothing **that unusual** about the display. The 80%-of-screen grey pattern had been seen many dates prior to the photograph session and was seen many dates thereafter (although subsequent attempts to recapture the same effect when the display was again seen resulted in nothing but additional photos of the 'blank' screen).

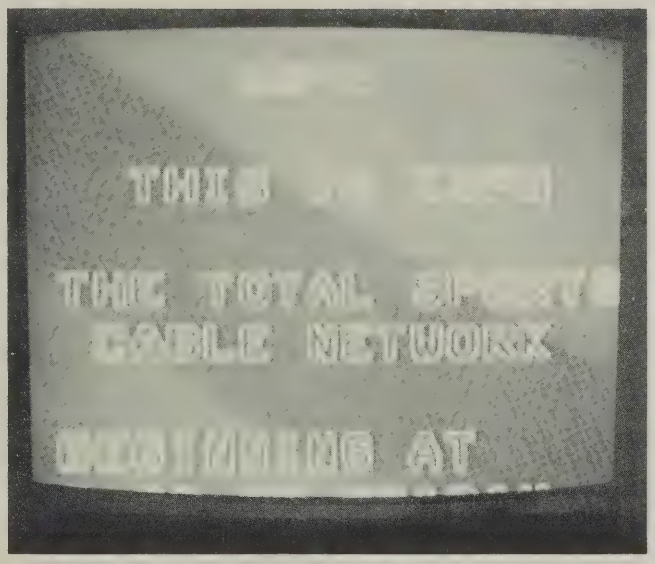
Was RCA transmitting one frame of video alternating with multiple frames of no video? Was it possible for the camera to catch in 1/30th of a second what the eye could not see?

What is the video portrayed? There have been as many suggestions as there have been people who have up to now seen the photo. The concensus is that we are looking at some type of aerial photo, either still or live, and the background area is the ground perhaps far below. The light streaks have been guessed to be water or roads. What are the clouded figures in the foreground? The best (or most consistent) guesses are that we are seeing a parachute jump; the lower center light colored dome array looks very much like the top of a parachute and since it is apparently further away than the others (except for a pair of similar objects on the right hand edge) it may be assumed to be more in focus than the two immediately in the center. The two center objects? Possibly two parachutists (just right of center one thinks one sees legs and even boots hanging down from the vertical object).

Was someone experimenting with the transmission of video information at a slow data rate (i.e. only for a portion of a second) within a carrier that was otherwise unmodulated? Would a camera that shot 30 photos per second have caught additional frames of the 'hidden video'?

The mystery continues to this day. We thought you'd like to see that sometimes what your eye sees on the CRT is not what is there afterall!

PROGRAMMING PERMISSION & LICENSING



WHAT HAPPENED TO ESPN?

ESPN (Entertainment and Sports Programming Network) began service to the cable industry (and others) via RCA Satcom FI this past September 7th on transponder 7. The reaction from the cable industry has been highly favorable with as many as 4,000,000 homes reported now receiving the ESPN service. This particular programming service is being marketed as a low cost programming service to the cable operators with 18-20 hours per day of operation during weekdays and 24 hour operation on weekends. As reported in some detail in the October issue of **CSD**, the service is largely sporting events rather skillfully arranged throughout the day and night so that virtually anytime a viewer gets the yen to watch a sporting event ESPN has one available. The service carries advertising and is designed to cost the cable service very little.

CSD and other publications have been quoting the ESPN rate at $1.40 per year, to anybody, anywhere. We have been in error, or at least recent events now make that information in error. ESPN's **base rate** to cable operators is $2.40 per cable subscriber spread over a time payment schedule. There are discounts for large cable operators and the rates do in fact reach $1.40 per cable home when maximum discounts for large cable operators are reached. However, ESPN now states that the rate for a **single residence** is **$100 for life.** The cable rate of $2.40 (sliding down to $1.40) is for a five year term, not life as reported earlier.

There is a substantial difference between $1.40 (or $2.40) and $100, and CSD contacted ESPN to find out why. Jeff James attempted to answer the questions for us.

"Basically, we had never set a policy on a private earth station or terminal before; we were simply dealing with the cable systems where the (base) rate is $2.40 per subscriber for five years. Then we were approached by some private users who wanted to carry ESPN and we just sat down one day and said '**OK, what are we going to do?**' and someone popped up with the idea of $100 for life. And we ran with that. I think we only have one or two private users who are actually under contract (at this rate)."

ESPN has no formal application form; interested people simply write ESPN a letter stating they would like to carry the service in their homes (ESPN, ESPN Plaza, Bristol, Ct 06010) and ESPN responds with a letter which states that you have the authority to tune in their service. Attached to the letter is an group of addenda which states that if you do initiate reception of ESPN that automatically indicates compliance with the applicable rules (of the FCC and the satellite operator).

Will the $100 rate stick? We asked James how ESPN handled the argument that the individual home terminal operator has invested his own (substantial) money in an earth terminal and like the cable operator no cost for the reception of the service is being borne by the programmer. Many private terminal operators feel that as long as they are providing the equipment, they should be entitled to the 'wholesale' rate, just as the cable operators pay.

James response. "I think these people have to recognize that wholesale buyers deal in bulk in virtually any commodity bought and sold in commerce today. If you go and buy an apple from a store, it is going to charge you a dime. If you buy 20,000 apples they might only charge you a nickle. Private operators have to realize that a cable operator is coming at us with 10, 15, or 20,000 people. Even **within** the cable community, if TelePrompTer comes at us with 1,000,000 subs, they are going to get a better discount than someone who comes to us with 500 subscribers."

What about STARSCAN's National Registration Bureau that is acting as a 'bulk buyer' representing hundreds or ultimately tens of thousands of individual home terminal operators? Has ESPN been negotiating with the National Registration Bureau/STARSCAN to work out an agreement where NRB buys in bulk and then redistributes the permission for ESPN on a terminal by terminal basis?

James again. "I'm not sure how we will handle that but my feeling at the moment is that the rate will be the $100 fee for NRB not the lower cable bulk rates".

ESPN's success in the cable marketplace has brought them to the attention of other categories of 'bulk distributors'. Hotels, motels and others of that ilk are a perfect example of the type of potential user now clamoring for contracts and service from ESPN. James. "The first question we ask them is if they have a cable franchise. The answer is obvious; they do not have a cable franchise."

To ESPN the 'holding of a franchise' is a key 'password' for qualification as a 'bulk buyer'. What about areas such as Texas where in unincorporated regions there are no such things as franchises? "That's a tough situation. We ask the fellow how many subscribers he has, or is likely to have if his system is new. If he says only one I find it hard to think he will be very profitable and he is really an individual home viewer."

Suppose he has a few hundred or otherwise acts like he is in a 'growth mode'? 'I'll probably treat him like any other cable operator; at least until we find out differently." There is no magic number; the cable operator has to act like a cable operator to be qualified for the 'bulk rate'.

The next marketing decision hurdle ahead for ESPN is the hotel market. Locations in Nevada, Las Vegas in particular, have swamped ESPN with requests for service. "These places want to be able to add ESPN's 24 hour sports schedule to their MATV systems." How will ESPN handle these new potential clients; as individuals or as (small) CATV systems?

"We haven't established a hotel rate yet but what we will probably do is set it up like a cable company and charge between $2.00 and $3.00 per room (for five years) because most of the hotels we are hearing from have upwards of 300 rooms. They are not unlike a small cable company and if you get a chain like Ramada Inns you get tens of thousands of room ultimately."

ESPN has also verified to CSD that they will have not only transponder 7 on SATCOM **FIII** (when it becomes activated) but that they will be utilizing transponder 7 on SATCOM **FI** as well. What are their plans for the second transponder on the second bird? Initially the FI transponder will be used to ship sport programming data **back** to their Bristol, Ct. uplink site where it will be taped or re-shot out on transponder 7 on FIII for direct viewing. In effect, it will become their "remote coverage feedback transponder". Ultimately? It is possible as more and more cable systems become equipped for both satellites that the FI transponder 7 may be utilized for split time zone feeds or even multiple feeds (i.e. ESPN x 2). In effect, it is both room for growth and an insurance policy against the future needs of ESPN.

As a marketing tool for those who are out looking for customers for earth terminals this 'clarification of policy' does two things. It puts ESPN (because of the rate structure) into the forbidden fruit region for most viewers. There is little doubt that $100 for a lifetime fee is something of a bargain (if both the viewer's life and ESPN's life stretches far enough) but it is a gamble requiring up front payment. However, on the positive side the liklihood that ESPN will be actively courting motel and hotel viewers suggests that readers of CSD engaged in creating markets for terminals have another powerful channel to offer to a segment of the marketplace barely scratched to date; motels, hotels and one would suppose other multiple dwelling units. If ESPN does follow through and establish five year period rates in the $2.00 to $3.00 (per room/residence) region, it makes the service an exciting one indeed.

PRIVATE USER CONDITIONS & OBLIGATIONS
[for ESPN]

1. This Agreement and the obligations imposed hereby is and shall be governed by, subject to, and interpreted in accordance with all terms, ruels, regulations, charges, practices and conditions of F.C.C. Tariff #1 including supplements or amendments thereto. Private user and ESPN shall comply wtih all provisions of that tariff, which is incorporated herein by reference and shall be a part of this Agreement.

2. Private user agrees to file with the Federal Communications Commission any necessary application and receive the necessary authorizations for the service from the Federal Communications Commission prior to the implementation of said service to the private user.

3. Private user will not charge admission or in any way exchange for value ESPN programming.

4. Private user agrees not to copy, record, reproduce, or duplicate any ESPN program or part there. Private user further agrees not to use any copy, record, reproduction, or duplicate of an ESPN program or part thereof without ESPN's prior written authorization. Private user will take all other reasonable and practical security measures to prevent the unauthorized copying, recording, reproduction duplication or use of any ESPN programming by others.

5. ESPN shall not be responsible for interruptions or discontinuances of satellite service due to factors beyond ESPN's control

6. ESPN retains the right to terminate this Agreement in the event that the private user fails to abide by the terms of this Agreement.

If you should opt to become a 'private user' of ESPN, here are the terms you will agree to abide by.

THE LAST UPDATE

The Satellite Private Terminal Seminar for February's 5, 6 and 7 in Miami, Florida is in its' final high gear stages. The

pre-registration trend in mid-December indicates that probably no fewer than 750 interested people will be on hand and the capacity of the hall (around 1,000) may just as easily be reached as late registrants pour in.

Of particular interest will be many new antenna, LNA and receiver suppliers who are planning to introduce new hardware at SPTS '80. Those who attended SPTS '79 will recall that at the Oklahoma City seminar there were a couple of joint efforts proclaiming that "the $4,000 earth terminal" was available. We believe that sharp students of pricing may find $2,500 earth terminal packages (using antennas, LNA designs and receivers from three **different** sources) possible at SPTS '80. **However**, low ball pricing may not be the best news of SPTS '80. Many talented suppliers are asking themselves just how much of the currently required hardware one can really take out of magic boxes and still produce quality pictures. It is our pre-SPTS '80/Miami **opinion** that while perhaps less and less expensive equipment **is** becoming available for the "buy it and install it" set that there may be some serious questions asked about whether cheaper hardware is necessarily the best direction to go in a marketplace that is still so new that the potential for installed systems at higher ticket prices has not been yet satisfied.

The Miami location presents some problems not present in Oklahoma at SPTS '79; the footprints from many of the domestic satellites are considerably weaker in South Florida than they are in the majority of the rest of the country and the cable industry cut over to FIII is not likely to occur until after February's gathering. This means that many antennas (smaller than 16 feet) will be strained to (and perhaps beyond) their capacities to produce noise free signals in this region on FI. (The liklihood that after the FIII cut over this region **will be able** to utilize 12 foot dishes is good but if FI is still in use during the seminar that won't help much!). Therefore attendees can expect to see many of the antennas on hand either looking at stronger satellites (WESTAR in particular) or providing living proof that a ten foot (or even 12 foot) is not a 'large enough antenna' **all over** the country.

Considerable seminar time will be devoted to the interconnection world; sessions on MDS and low cost cable re-distribution systems will be on the program, as well as a special session for the Caribbean, Central and South American

attendees (in Spanish and English) describing 10 to 100 watt UHF (TV band) transmission systems (with converters) which can be operated in many countries as low-frequency-MDS approach systems.

Through an arrangement with **Instant Replay**, the full program (consisting of more than 25 separate lecture sessions) will be videotaped and for those who are unable to attend or who would like videotape copies of some (or all) of the sessions, they will be available through Instant Replay at the seminar and directly afterwards on BETA and VHS formats (as well as 3/4 inch). In the exhibit area Instant Replay will have two separate 'video theaters' set up and operating during both the exhibit hall hours and between sessions during lunch and each morning. In these video theaters will run approximately 15 separate videotape features depicting how the satellite system operates, what hardware looks like and how it all goes together. These tapes, from the STT 'library', will give attendees the opportunity to 'visit' the Howard Terminal, the Coleman Terminal, Oliver Swan's Arizona location where the Spherical Antenna was developed and much more.

SECOND CUT - SPTS '80 MIAMI PROGRAM SCHEDULE

Here is the Miami program schedule as it shapes up late in December. A full printed program with considerable detailed explanation for each session will be included in your SPTS '80 Miami Program Packet which you will be able to pick up at the registration desk at Bayfront Park Auditorium between 2 PM and 6 PM on February 4th or after 8 AM on February 5th.

Time	Tuesday, February 5th		Wednesday, February 6th		Thursday, February 7th	
	Main Hall	**Shuch Hall**	**Main Hall**	**Shuch Hall**	**Main Hall**	**Shuch Hall**
8AM-8:50		Videotape		Videotape		Videotape
9AM-9:50	Introduction to TVRO Language	Spanish-Behar	Taylor Howard	Shuch #5	LNA Technology	Spanish-Behar
10-10:50	What FCC De-regulation Means	Shuch #1	Robert Coleman	Shuch #6	What's On The Birds?	Shuch #10 (Videotaped)
11-11:50	Getting Pro-grammer Permission	Shuch #2	Copyright Status	Shuch #7	12 GHz Satellites When and Where?	Shuch #11 (Videotaped)
12N-1:45 PM	**Exhibit Hall Open**		**Exhibit Hall Open**		**Exhibit Hall Open**	
12:30-1:30		Videotape		Videotape		Videotape
2PM-2:50	Distributing TVRO Gear	Shuch #3	To Be Announced	Shuch #8	Low Cost Antenna Technology	Shuch #12 (Videotaped)
3PM-3:50	Marketing Experience To Date	Shuch #4	MDS/Cable Interconnect	Shuch #9	The Year Ahead	
4PM-6PM	**Exhibit Hall Open**		**Exhibit Hall Open**			
4:30-8:PM				Videotapes		
6PM-8PM			**Exhibit Hall Open**			

Here are the highlights of the February 5-7 SPTS in Miami as they shape up late in December:

1) **$1800 tuneable receiver** - ready to plug in and turn on. A brand new private terminal receiver to be shown for the first time in Miami.
2) **$850 up antennas** - a large selection of new antennas including a fiberglass ten footer at a new low price!
3) **Everything At The Antenna** - an innovative feedhorn **with** LNA **and** the complete receiver built into the horn! You run RG-58/9 coaxial cable to the TV set inside and 'everything is at the antenna but the picture'. Price range? **$1800 wired and tested!**
4) **Private Satellite Users Net** - a bold plan whereby home terminal operators will form their own network and rent transponder time as a group!

Time is running out and space is disappearing fast. Have you registered for SPTS '80 Miami yet?

All attendees will have the option of receiving a copy of the current editions of the Howard Terminal Manual, The Coleman Terminal Manual and the Swan Spherical Antenna Manual as a part of their registration fee; or turning one or all three back in for a 'credit'.The Coleman Terminal Manual is currently undergoing an extensive updating and if everything works out correctly the substantially revised Coleman Manual will be first available at SPTS '80.

San Jose City College's H. Paul Shuch will once again be on hand to conduct his now famous 'mini-symposium' on satellite system engineering and technology and there should be plenty of seating this time for Paul!

SPTS '80/Miami promises to bring together the very latest in low cost satellite hardware, the innovators who have created this hardware and the hundreds of people from throughout the Western Hemisphere who are in a position to best put this hardware out into the field and into good use. Returning will be Taylor Howard, Robert Coleman and Oliver Swan; all of whom have made substantial progress on their various approaches to low cost hardware technology **since we last met** at SPTS '79. In particular, Coleman and Howard have combined their talents to produce a totally new state of the art system that marries Coleman's GaAs-FET front end and his GaAs-FET active mixer (with Avantek VTO 8360 LO) to a new Howard created 70 MHz i.f. strip followed by the latest single-board (Howard plus Coleman created) 70 MHz to baseband demodulator system.

All of the elements will be on hand to send you home filled with hundreds of new ideas and concepts about the rapid development of low cost satellite receiving hardware and systems. **Pre-registration is mandatory** and you may either utilize the registration card found inside of this issue or contact: **Susan Cooper** at **SPTS '80, P. O. Box G, Arcadia, Oklahoma 73007** [405-396-2574].

FOR YOUR EARTH STATION, CHOOSE

AVCOM'S PSR-3

SATELLITE VIDEO RECEIVER

DESIGNED FOR YOUR PRIVATE TERMINAL

- Remote tuning
- Dual video outputs
- Exclusive Clamp-Sync & Scan-Tune
- Many other features!

AVCOM of Virginia, Inc.
10139 Apache Road, Richmond, VA 23235
(804)320-4439

SATELLITE POTPOURRI

MORE CANADIAN NOTES

The Canadian press continues to be active with reports on the growing number of 'illegal' satellite receive terminals now operating; especially in that country's far northern regions. The following report has been edited from an article appearing in **MaClean's** this past October, a Canadian general circulation magazine. Again we explain to **CSD** readers that this is not technical material but rather it was written by a layman for consumption by other laymen. However because of the nature of the report it provides keen insight into the building pressures in Canada to somehow force the Canadian government to work out an accomodation with the U.S. government so that Canadian viewing of U.S. DOMSAT birds can be done legally.

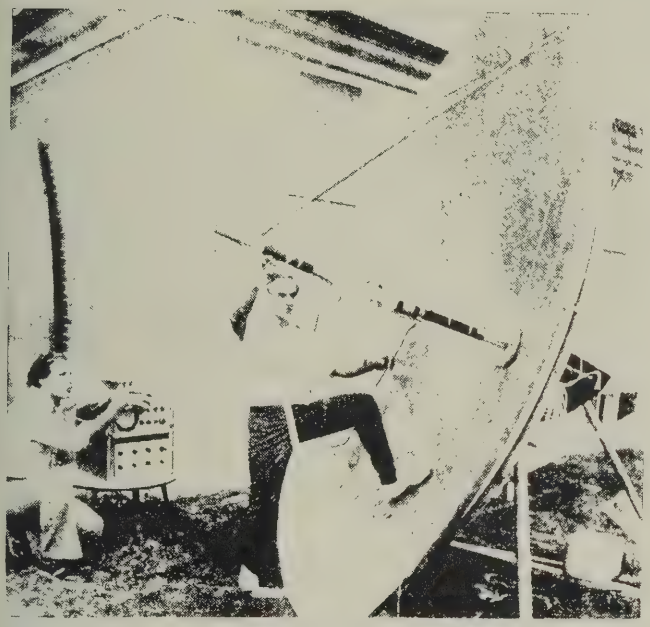
For years Iris Bowen and her neighbors in Faro in the central Yukon suffered through the long northern winter with only the help of the CBC's Northern Service and the annual Ice Worm Squirm winter carnival. Then last year an outfit called Canadian Satellite Systems knocked on the door and said she could sign up for three extra channels, channels that could get her ''Jaws'', ''High Anxiety'' and Hollywood specials long before they ever got to television in the South. Iris Bowen signed up, and so did 400 of her 2,000 fellow Faroites.

That's how it is all across Canada's North - aluminum dish antennas - sprouting like tin mushrooms on community-centre roofs and in backyards. Aimed heavenward they pluck from an RCA satellite 22,000 miles above earth the signals that were intended for U.S. cable networks and their subscribers. In putting in the disc systems, the 70-odd entrepreneurs responsible have crystallized the debate surrounding an entire area of highly sophisticated, little understood technology. What they have begun represents what outgoing chairman of the Canadian Radio-television and Telecommunications Commission (CRTC) Pierre Camu terms, ''a revolution as fundamental as the one television created for audiences more than 25 years ago.''

The problem is, though, that those satellite dishes that are keeping northerners so happy are illegal. The system owners have a letter from the federal department of communications (DOC) saying so. But they also have copies of a CRTC policy paper indicating agreement with their actions in principle. Understandably, they are confused.

At issue is much more than the question of 200,000 Canadians now under-served by southern television signals. No one inside government or out questions the allegation that northerners are getting a raw television deal compared to their southern cousins. But the northern earth-receiving stations cannot be licensed now because they are in violation of a 1972 ''exchange of letters'' between the U.S. and Canada that stated that Canadians could not pull U.S. television signals off U.S. satellites and vice versa. (So far the U.S. has not considered the unpaid use of its signals widespread enough for concern.)

Given the DOC admission that an inequitable situation exists, throwing the pirates in jail would be political



TWO LEADING CANADIAN SATELLITE BUFFS - David Brough [left] is best known for network of 1 to 10 watt VHF band rebroadcasting stations fed via tape from southern Canada (and now satellite) **while Jan Spisar** (right) **was one of the engineering geniuses behind Canadian cable manufacturer Triple Crown Electronics before he became a satellite system designer earlier this year. Spisar is highly recommend for working out satellite hardware design problems and can be reached at [416]677-4314. Brough has an unlisted telephone number[!].**

anathema, and jamming signals already in the air would make no more sense. Current DOC thinking appears to favor competition - inducing the private sector to provide alternative Canadian northern signals on Canada's woefully underused eight-year-old Anik satellite system. "Too expensive," respond private broadcasters.

The cable companies also plead expense, but indicate they could be enticed if the revenue-producing sweetener of pay-television for southern markets were included in the same satellite package that sends "Lou Grant" to Faro. Nationalist groups oppose any saw-off that would bring in largely U.S. pay-TV - long opposed by the CRTC - in exchange for increased choice for the North. "Diabolical," says Vancouver Association for Public Broadcasting spokesman Tom Shandel. Nonetheless, a northern television package fuelled by lower Canadian satellite rental rates and other sweeteners reflects current thinking.

Meanwhile, new Communications Minister David Mac Donald has quietly been crossing the country conferring with provincial ministers responsible for communications.

But even as the bureaucracy lumbers along attempting to deal with the brush fires of a handful of pirates in the north, the DOC is conducting an experiment that may herald the arrival in selected remote and rural areas of northern B.C. and Ontario of about 100 home-top, 3.5-foot-diameter dishes. They will pick up Canadian Anik B signals and translate them for the home set with no cable company in the middle.

The implications are sobering. With progressively cheaper parts and simplified technology, dishes could replace both the rusting antennas of the 1950s and 1960s and the silvery cable of the 1970s, allowing Canadians to scan the night skies unhindered. Indeed, experts foresee a complete mixed system of satellite discs and cable by the 1990s. With the newly vacant space on cable which may then be filled with information retrieval and accounting functions, the DOC will be charged with the daunting task of drawing up a rule book in this startling new electronic ball game.

"There is clearly a sense of urgency," says the DOC's senior policy planner, Jean Fournier. Implied is a challenge to Canadian broadcasters, faced with a phantasmagoria of new and mainly U.S. signals. Optimistically Fournier talks of "the enormous marketing potential of beaming Canadian programming into the U.S." Others mutter about Canadian programming engulfed in a barrage of U.S. images. "We simply couldn't compete with unregulated U.S. programming," worries one CRTC official.

In Faro, meanwhile, the first unsettling whiffs of future shock have already begun to descend. For Iris Bowen the diversionary benefits of pirate dishes are tempered by concern that her nine-year-old is receiving a quick big-city education via the randy gutter dialogue of uncut movies on U.S. pay-TV. And across town at least one failing small business wishes it had never heard of earth receiver stations. It seems the discs can get the latest movies into the town's living rooms long before Faro's lone theatre is able to show them. Welcome to the 1980s.

PROGRAMMING CORRESPONDENCE

ARTHUR C. REVISITED

Here is another picture for you - a warning to others! It all happened in one second - I would never have believed that a wind gust could have moved a half ton of hardware such a distance horizontally. Anyway, since the antenna wasn't doing anything it solved one problem...

You would have enjoyed TELECOM 79, the exhibition preceding WARC. It was **enormous** - probably the biggest electronic exhibit ever. All of the COMSAT people were there including Hughes, Ford, Scientific-Atlanta. I met more people than I can remember including Group Captain (now Sir Edward)Fennessey, retired head of the GPO, who in 1943 selected Pilot Officer Clarke to work in GCA; and so is the **grand**father of satellites!

(During TELECOM 79) I was the main INTELSAT 'exhibit', signing copies of a beautifully reproduced poster of the four page memorandum - now hanging in the Smithsonian - that preceded the Wireless World article.

On the bottom of Page P16 for October (CSD), I was the first with a porno network (see the short story 'I Remember Babylon' in "Tales Of Ten Worlds"). I wrote this around 1959 to scare the U.S. into thinking about satellites! Little did I realize what your own (cable TV) systems would be doing one day...

Though I haven't had time to look into this (or the expertise now - I couldn't even draw a one-stage transistor amplifier since I still think in terms of glass bottles with red-hot hairpins inside of them) my feeling from a quick glance at the (STT) Satellite Wall Chart was that all of the Indian Ocean satellies would need far too large antennas. But all of that will change...

Arthur C. Clarke
Colombo
Sri Lanka

Arthur C. Clarke, our candidate for 'Father Of Satellites', was featured on the front cover of CSD for October, and his Wireless World article that described our present system, way back in 1945, was reprinted for the history buffs out there. Sadly, the 15 foot SITE experiment antenna shown with Clarke on October's CSD is now a pile of rubble [see photo]. But as Arthur notes, with SITE now dead and gone [and ATS-6 out of commission] this is one way to get rid of the antenna! [Note the broken bannister where the antenna plowed off of the balcony to the ground below.] It is our project for 1980 to try to locate some way for Father-Clarke to have satellite TV reception in Sri Lanka. We agree with him that the 22 dBw Global Beam transponders from INTELSAT are not all that attractive and really doubt he would be interested in regular viewing of the stronger [29-33 dBw] Russian Statsionar birds. We think that there must be an answer but for now we can't find it. Surely out there someplace there is a far-sighted equipment supplier that would like to be able to say in his advertising that "The Father Of Satellites Uses XXXX Equipment in Sri Lanka"! **Intrigued suppliers, if any, should contact Coop directly.**

UNFAIR ACTS

When I read of Coop's plight and court fight with the Common Carrier Association of America (CCAT) and the local Oklahoma City MDS outlet Movie Systems I was saddened. As I understand it, Coop wanted to teach the technology of MDS receiving systems as a minor part of SPTS '79 held this past summer in Oklahoma. It is truly a disgrace in this country when freedom of speech is impeded before the words are uttered, and technical conferences are subjected to the whims of special interest groups who actually want to stop the flow of technological information! I cannot understand the hypocrisy of a group that freely contracts with HBO or SHOWTIME to re-distribute their movies over MDS systems, knowing as they do full well that the mere re-transmission of these copyrighted programs invites people to set up BETA and VHS taping equipment to invalidate that copyright; and then turning around and claiming that your technical seminar is a violation of Section 605 and the 1976 Copyright Act! Then I understand that if this was not sufficient harrassment that the same groups filed against Coop at the FCC demanding that his developmental TVRO license be taken away. The efforts put forth out there in Oklahoma are appreciated; I want to lend to you my moral support and encourage you to keep on fighting not only for yourself but for all of the other experimenters in the world. Keep the faith. We will triumph in the end.

Jerry D'Iorio
Boston, MA 02116

Those attending SPTS '79 in Oklahoma City were aware that just four days ahead of the Seminar CCAT and Movie Systems asked a Federal Court Judge to issue an order canceling the Seminar. The Judge listened to the evidence and then ruled against CCAT and Movie Systems and the Seminar went on. Meanwhile the same heavies went to the FCC and claimed Coop was engaging in all sorts of prohibited and illegal activities with his WF92 terminal. It took numerous pleadings, meetings with FCC attornies and volumes of paper to straighten that one out. In the end CCAT and Movie Systems withdrew their FCC complaints and several thousands of attorney spent dollars later it was all forgotten except for the box of legal papers stuck up in a corner in Coop's downstairs Lab room. CCAT won nothing except some cheap trade press sensationalism stories. Their Washington based attorney-coordinator will probably get a big fat raise for raising all of the issues he did; although if he was paid on a merit basis he would owe them money instead!

PROMOTIONAL DATA AVAILABLE

ALTERNATE INFORMATION SOURCES

Satellite Week (1836 Jefferson Place NW, Washington, D.C. 20036) is a weekly first-class-mail delivered newsletter providing extensive coverage of legal, WARC, programming and satellite operational news in abbreviated format. Exceedingly well done but expensive. Subscription price is $327 per year.

Satellite News (8401 Connecticut Av., Washington, D.C. 20015) is issued twice per month and mailed via first class mail providing coverage of programming and satellite operational changes (does **not** include program **schedules** in case you wonder) in the satellite business. Subscription is $147 per year; differs largely from Satellite Week by having slightly greater in-depth material.

For fans of everything that appears in print dealing with satellite television, these materials are now available or will be available shortly:

RADIO ELECTRONICS MAGAZINE - Part four of the seven part Coop epic appears in the current January issue; parts 5 through 7 will follow monthly. These last four parts (1 through 3 appeared August-October) will deal primarily with assembly off a low cost terminal utilizing hybrid Swan/Howard/Coleman technology. **Note:** Coop is scheduled to begin a regular **monthly** 'column' in this publication with their March issue; the column will deal with the develoment of low cost satellite TV technology in an abbreviated format.

POPULAR SCIENCE - Another Coop produced piece will introduce the several million regular readers of PS to the wonderful world of geostationary satellites in their issue

dated for March (due out in mid-February on newsstands). Largely a synopsis of things you already know, in abbreviated format because of space limitations but worth adding to your library.

ENTREPRENEUR - The December issue carried a report on the business opportunities in MDS (multi-point distribution systems) and some coverage of what is happening with low cost satellite systems. Thrust of publication is directed at people with dollars and time to invest in 'new' business opportunities. MDS report is factual but we felt it skirted the 'piracy problem' too lightly. If you have aspirations to connect your TVRO terminal to an MDS transmitter and 'share' (as in selling) the service to other residents of your area, we recommend getting a copy of the December 1979 issue from: Entrepreneur Magazine, 631 Wilshire Blvd., Santa Monica, California 90401.

ABOUT INSTANT REPLAY

Those attending SPTS '80 in Miami will have the opportunity to watch an extremely professional and innovative group of video professionals at work; the staff and crew from INSTANT REPLAY.

Instant Replay is a 'video magazine'; publisher Charles (Chuck) Azar believes his publication is the front running vanguard of the form of all publications of the 80's. Says Azar "Television in the eighties and beyond will be an active rather than passive instrument. Linked to personal computers and accompanied by cassette recorders and video disc players, the television will serve as filing cabinet, bank book, communications center and information headquarters in the streamlined household. And yet it may continue to be a source of entertainment...".

IR (as it is fondly known) distributes on tape (Beta or VHS) worldwide through the mails and through a network of dealers. IR approaches a topic just as any other publication does. Will the material be interesting, entertaining and/or educational for "readers" (viewers)? Only unlike the traditional journalist Azar and his inexhaustable crew travel the world lugging around portable color cameras and video tape gear. A fair amount of Azar's "beat" is the elctronics world since he shrewdly deduces that many of the early buyers of home VCRs are themselves somewhat hung up on things electronic. Chuck looks for people who have made major contributions to the explosive growth of electronic communications, runs them down and then spends a day or two capturing them on videotape. Back in Coconut Grove, Florida the IR production crew edits the material down into a series of 'articles' that fill the typical two hour magazine each issue. Sports, events, and unusual thrill rides that capture well on videotape are also heavily covered. Would you like to take a ride in the cockpit of a famed World War II P-51 fighter plane? A recent IR did this. Visit Dr. Vladimir Zworykin, the inventor of electronic television? IR does this. Or travel to Germany where IR attended the Internationale Funkaustellung '79, the world's largest and most important A-V festival? IR did this also and threw in a visit to a most impressive German INTELSAT uplink terminal at the same time. Satellite television gets good coverage on a regular basis. Azar has many friends in high places in the electronics and satellite fields and he managed to squeeze comments out of Sony on their satellite TV hardware plans in a recent edition as well.

IR is good viewing and very informative at the same time. It plays well again and again and because it is an innovative approach to electronic publishing it is attracting plenty of interest right now from others who will surely follow in IR's footsteps. One is bound to notice that Time-Life is a heavy investor in videotape projects these days and the day is undoubtedly coming where Azar will have some pretty stiff competition in his field.

For now he is the pioneer and his work is worth every penny of the modest subscription price. We think you wil enjoy Instant Replay and we encourage you to seek out the IR booth at SPTS '80 in Miami to find out just how far video journalism has come in two short volumes of this innovative video magazine.

IR PUBLISHER CHARLES AZAR (right) **with Dr. Vladimir Zworykin, creating the mood for a visit with the famous inventor of electronic television. IR can be found at 2980 McFarlane Rd., Coconut Grove, Fl. 33133** (305/448-7088).

Bob Cooper's Satellite Television Technology prepares a weekly one hour television program for continent-wide distribution via satellite on **SPN** transponder **21** at 12 noon (eastern) each Thursday. Two 'new' programs are prepared each month and each program runs for two consecutive weeks.

During the past fall satellite technology noteables such as H. Paul Shuch, Oliver Swan, Taylor Howard and many others have appeared. The program attempts to cover the fast moving technology explosion of both satellite and cable services and much of the video material utilized is shot 'in the field'.

SPN is a no-charge service and this service typically grants permission to home viewers to tune in the program without hassle. Specific approval for viewing **Satellite Magazine** can also be obtained directly from Bob Cooper at Satellite Television Technology (P.O. Box G, Arcadia, Oklahoma 73007). When your terminal is up and running, tune us in!

BIRD OPERATIONAL NOTES

Looking for sources of HBO, Showtime and Madison Square Garden program listings? Many newspapers (New York Daily News, Miami Herald, etc.) now publish daily listings for their subscribers. Additionally, there are many editions of **TV GUIDE** (which is published and distributed nationally but with regional editions for differing program listings to match the local TV fare) which have one or both sets

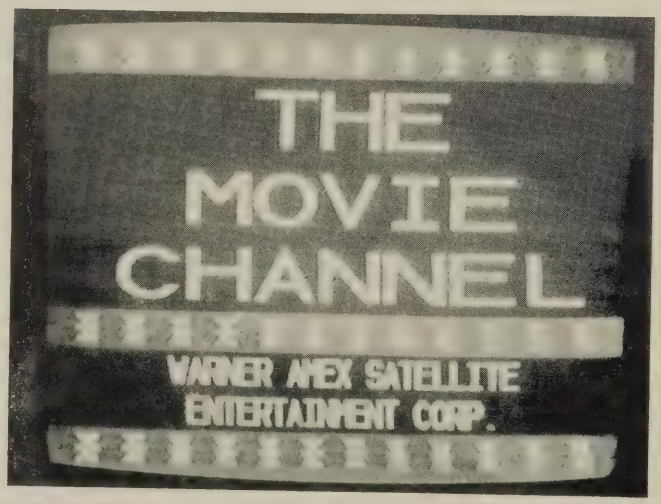
of premium television listed.

A subscription to **TV GUIDE** (the **New York City Metro Edition**; from TV GUIDE, Box 400, Radnor, Pa 19088 at $18 per year) is one source that combines both HBO, Showtime plus Madison Square Garden listings. Another source is **TV WORLD** (505 8th Avenue, Suite 1801, New York, N.Y. 10018) which includes listings for satellite signals WOR (transponder 17, WTBS (transponder 6), Madison Square Garden Sports (transponder 9), Home Box Office (transponders 22/24) and Showtime (transponders 10/12). The subscription price for one year is $12.

Then there is the announcement that a new publication called **'Satellite Guide'** will be available starting with the month of February. SG, we understand, will have day by day listings for **all** of the (SATCOM) transponders and the one year subscription price is pegged at $28. You can make inquiry at **Satellite Guide**, PO. Box 1569, Hailey, Idaho 83333.

Approximately 50 of the Holiday Inns scheduled for TVRO installations are now operational. Job is being split between Scientific-Atlanta and Microdyne/AFC. In Houston area two Ramada Inns have also installed TVROs on an ad hoc basis, not as a part of any yet approved Ramada Inn **national** policy.

WOR-TV became 24 hour per day service recently running vintage movies through the wee hours on transponder 17. **STAR CHANNEL** officially changed name to **THE MOVE CHANNEL** ON December first and also became first premium program supplier to go to 24 hour per day service (transponder 5 all day and night; transponder 11 nighttime only).



In approving RCA launch of FIII late in November FCC asked satellite firm to provide informational detail on the way transponders are assigned, on semi-annual basis. Until now FCC has stayed out of squabbles between satellite ops and transponder users. Galavision and Eastern Microwave (WOR) have filed objections to manner RCA handles 'customers'. Galavision renewed contract with Reuters for nighttime use of transponder 18 for Spanish language premium program feeds through 1981 but still seeks transponder assignment of its own. New transponder 4 (FIII) National Christian Network will be 24 hour per day service.

Westar I transponder 7 has been experiencing output problems; is being run at 6 dB down reduced output much of the time.

SPN has added ''All Night At The Movies'' service from 1 to 7 AM (eastern) on transponder 21. Movies are from 1930's to 1950 era.

Cineamerica will be new national satellite network for people over 50 years of age on FIII; Satellite Communications Network is another with programming from Ohio Premium Network.ESPN has taken transponder7 on FI as well as FIII and will use second transponder for feeding events back to headquarters in Ct.

Latest 'group' to eye satellites are newspaper publishers who see national satellite inter-connection as way to increase delivery of high quality advertising formats, news services and other material.

Monday Night Boxing (''live'') from various U.S. locations will debut on January 21st. One hour telecasts will be up at 10 PM eastern weekly on FI (then FIII when operational).

Another new service scheduled for Spring operational date is 6 hour daily feed of **BBC** programming from England brought to satellite by Time-Life Satellite Network (TLSN). Schedule calls for 8 PM to 2 AM feeds (eastern) probably on transponder 20 (sub-let from HBO).

TCI, Denver based firm that has agreed to purchase $5 million in HOMESAT terminals from S-A, is now installing terminals. Rate is $150 per month (after $3,000 installation fee) for seven year contract ($15,600 total) on lease; service consists of HBO and TCI pays HBO fee. TCI says market is 300,000-plus ranches with annual (gross) incomes of over $50,000 per year; most early installations have been in Montana but area is now expanding throughout Rocky Mountain area. HOMESAT says they plan to be able to deliver up to 200 terminals per month with 3 meter antennas before end of first quarter this year.

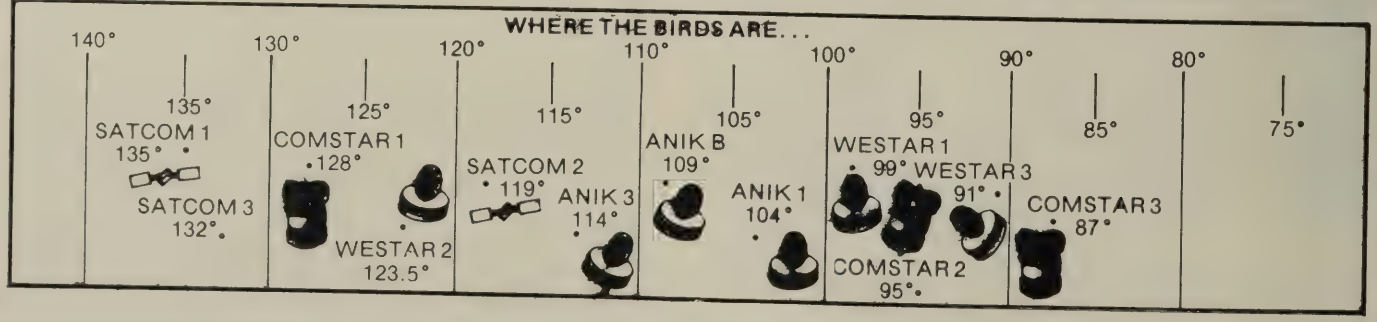
European TV Service has begun feeding weekly news feature magazine directly to PBS stations via WESTAR I (Tuesdays, probably on transponders 8, 9 or 11). Spanish version is telecast on Wednesdays.

Madison Square Garden Events (transponder 9, FI/III) began schedule of indoor soccer league games in December; will continue through mid-March.

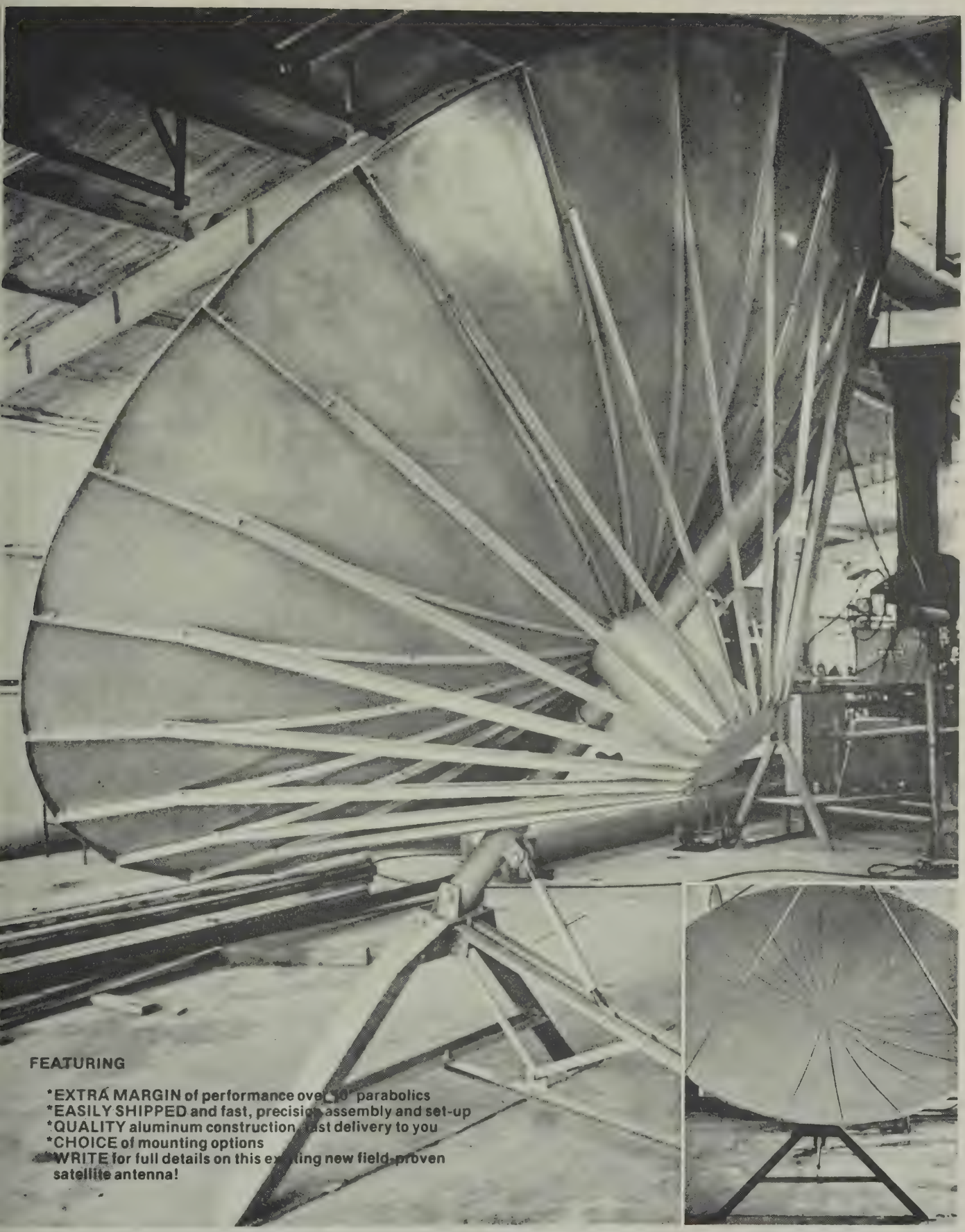
Mysterious coverage from ANIK-B (operating both 4 and 11/12 GHz downlinks at 109 degrees west). 4 GHz service is reported sparkle-free **as far south as Miami** (FI.) and over all areas to north along east coast on 12' dish, 120 LNA.

SPLIT ISSUE

Effective with this issue of **CSD** those people who have ordered only a single section (such as the Programming Section, which you are now reading) will be receiving only the section ordered. Prior to this time **CSD** has been supplying both sections to all readers simply because the small number of ''one-section-only'' readers has not made it worth our while to separate issues. However with the subscription list growing rapidly, the time has come to deliver to you what it was you ordered. If you have grown attached to the full issue (Technical plus Programming) you may upgrade at this point by requesting same (provide your name, address and mailing label) with a $20.00 check attached.



INTRODUCING: ADM's ELEVEN FOOT SATELLITE ANTENNA

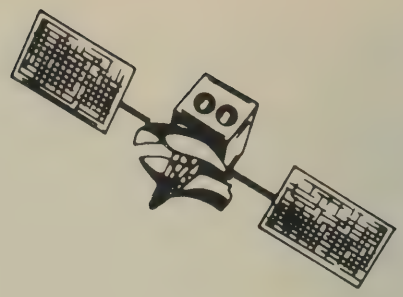


FEATURING

- *EXTRA MARGIN of performance over 10' parabolics
- *EASILY SHIPPED and fast, precision assembly and set-up
- *QUALITY aluminum construction, fast delivery to you
- *CHOICE of mounting options
- *WRITE for full details on this exciting new field-proven satellite antenna!

ANTENNA DEVELOPMENT AND MANUFACTURING, INC.
2745 Bedoll Av., P. O. Box 1178, Poplar Bluff, Mo. 63901
Telephone (314)785-5988

SPTS '80



MIAMI, FLORIDA

FEBRUARY 5, 6, 7

MIAMI'S BAYFRONT PARK AUDITORIUM

THE BIG EVENT! Following the same highly informative and successful format of SPTS '79, Bob Cooper opens the 1980 Satellite TV season with SPTS '80 February 5, 6 and 7 at the Bayfront Park Auditorium in Miami, Florida. Three big days of technical lectures, marketing sessions, exhibits and live satellite demonstrations all designed to bring you up to date on the fastest emerging new television technology of our time!

THE EMPHASIS IS EVERYWHERE! For the technology buff, Stanford's Taylor Howard and Robert Coleman of South Carolina have merged their talents to create a **new** single conversion super receiver for the 80's! Active GaAs-FET technology front end and mixer, combined with a new Howard-Coleman solid state 70 MHz i.f. and demodulator circuit will be shown for the first time at SPTS '80 in Miami. A truly simple, high performance receiver! **For the business person**, numerous panels dealing with the newest in commercial hardware, receive system marketing experience and the impact of the FCC's deregulation of licensing. For the system designer and engineer, 12 (twelve) H. Paul Shuch 'TVRO Symposium' sessions designed to teach you 4 GHz technology from the sky down!

FOR EVERYONE - exhibits, operating satellite terminals, satellite system videotapes and plenty of literature and hard to find satellite TV data. **FOR CARIBBEAN, CENTRAL AND SOUTH AMERICAN RESIDENTS** - two special sessions (in Spanish) detailing the reception conditions and requirements in that area of the world. **PRE-REGISTRATION IS MANDATORY!** Every indication is that this 1,000 seat auditorium will be filled to capacity with pre-registrants by the middle of January. To be sure of getting into SPTS '80/Miami, send off your registration application today. Full hotel/motel registration data will be sent to you with your confirmation.

___ **$150 PER REGISTRANT ENCLOSED.** Please rush our confirmation and the information regarding hotels and motels.

My Name _____

Company (if applicable) _____

Address _____

City _____

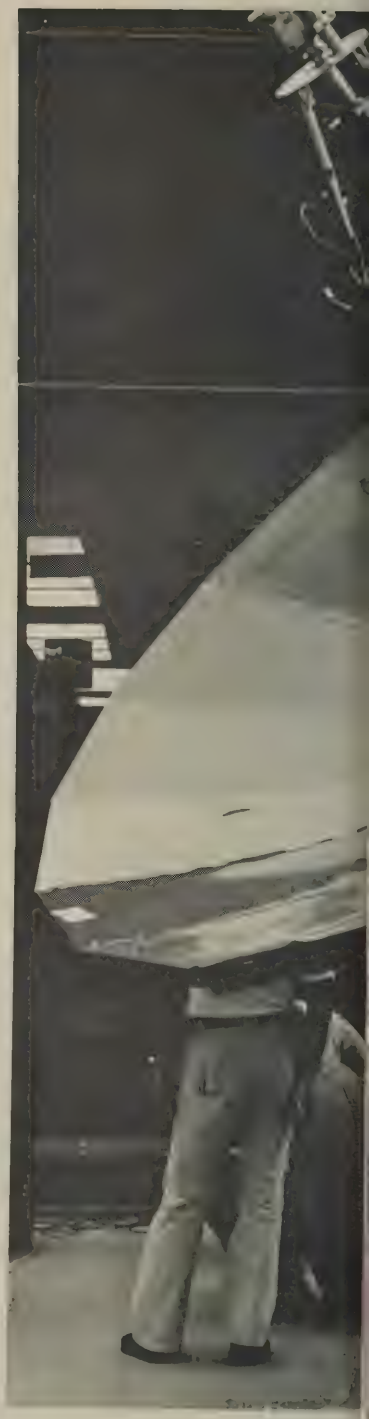
Enclose full payment in U.S. funds for all registrants and mail to:

STPS '80/Miami
P.O. Box G
Arcadia, OK 73007
(U.S.A.)

SPTS '80
Is A Production Of
Bob Cooper's
SATELLITE TELEVISION TECHNOLOGY

INSIDE THIS ISSUE
Super Deluxe Receiver Kit
THE WASHBURN TVRO RECEIVER
Antennas Get Simpler, Cheaper
LOW COST ANTENNA PRACTICES
Straight Overhead!
RUSSIAN TV BIRDS OVER U.S.
Gone But Not Forgotten
THE FIII DISASTER
COOP'S
SATELLITE
DIGEST
FEBRUARY 1980
WELCOME-SPTS 80!

PARAFRAME



MOST-ADMIRED AT SPTS '79 was the PARAFRAME ET/3.66 (12-foot) TVRO antenna. Those who saw us go "cherry-picking" on Day Two won't soon forget the fine reception we got from ANIK-B, while using a 150°K LNA. That's big performance and if you were there YOU SAW IT! For reception photos and product information, write or phone "Mr. Paraframe," Jim Vines.

Paraframe, Inc.
1000 Sunset Drive West
P. O. Box 423
Monee, Illinois 60449

Phone 312/534-7435

COOP'S COMMENT ON TECHNOLOGY

SURVEYING WHAT'S NEEDED

As approximately 1,000 satellite TV enthusiasts, business people and curious invade the Bayfront Park Auditorium in Miami early this month we will be again meeting to see just how far the state of our technology has grown in approximately six months. The August SPTS '79 had a special pioneering spirit attached to it; we battled and beat back a federal court suit that attempted to stop SPTS before it began and we came from more than 40 states and perhaps a dozen countries to learn, share and feel the excitement of an industry being born.

If my reading of the registration forms has any meaning the Miami crowd is somewhat different than the Oklahoma City crowd. There are fewer technical people in attendance (**as a proportion of the whole** although their numbers may actually be larger since we are dealing with twice as many people) and certainly many more would-be-entrepreneurs who sense in the satellite evolution one or a dozen different business opportunities. Certainly our international reach is far larger; enthusiasts are converging from each of the six continents to attend SPTS and those who have traveled from Australia, Japan, throughout Africa and the middle-east are to be appreciated for their sheer stamina in making the trip.

Now, what do we find in Miami at the first SPTS of 1980 (another will be held in the San Francisco Bay area in June)? First of all we notice that the demand for hardware is suddenly way out of balance with the ability of the suppliers to supply. SPTS delegates from South America, the South Pacific and Africa waiving around $100,000 to $1,000,000 Letter-of-Credit backed purchase orders may be upset because few of the firms of hand with hardware in this field at this time have the ability to fulfill such orders. Here are established (foreign to the U.S.) firms qualified to purchase a million dollars or more in satellite TV hardware at a whack unable to find qualified suppliers to fill their orders! Certainly something must change in this area before we all arrive in California at the second SPTS in June.

Next we find a sudden sophistication in low-cost hardware mixed with ever simpler really low cost hardware. We find in this issue of CSD that ten foot reflector surfaces can now be purchased from the OEM for $520 while at the same time we see some very clever automated 10 to 15 foot antennas on view outside the exhibit hall area in the $3,000 up range.

In the electronics end we see that Taylor Howard and Robert Coleman have developed a hybrid receiver concept which Coleman has been heard to say 'could be sold' for around $1800 (LNA + receiver, wired and tested); a complete terminal, less only the reflector surface. At the same time we find that the duo had developed vastly improved phaselock demodulator circuits for the original Howard Terminal receiver and at SPTS '80 circuit boards are finally available for most of their designs. We also find that a new name to the satellite receiver area, Clyde Washburn, is on hand with a very elegant 24 channel tuneable receiver system backed up with circuit boards, parts kits or even wired and tested modules through well known supplier Ramsey Electronics. We also find that Bob Behar's A-B Electronics has a new 24 channel tuneable receiver in the $1800 price range.

And this touches the surface of what is new and on display at SPTS '80. **Now what is really needed in the way of additional product innovation?** Let's start with 12 GHz. The Canadian ANIK-B satellite is now operational with a couple of English language channels including Canada's first ''super station''; Vancouver's CHAN-TV. The first INTELSAT V satellites, also operational (for the first time for INTELSAT) at 12 GHz, are scheduled to be turned on this year. All of the evidence tells us we need some hard and fast 12 GHz design data to start building 12 GHz gear; right now. The 12 GHz band offers inexpensive alternatives to 4 GHz with smaller (3-6 foot) antennas. Who's working on it? Steve Birkill in England is and within months we'll have some construction data on hand here in **CSD**.

Next we need some lower cost LNA technology. We've watched receivers become simplified and antennas come down in price as their production rates have gone up.LNAs are still $1000 up boxes and difficult to build (although many are building their own). For an opener, I'd be happy to see a complete high-quality LNA kit on the market. **Complete** means with the proper boards, input matching circuit, parts **and** housing. Tay Howard had been working on this but he warns me that even with 'characterized' GaAs-FETs he finds the builder has to 'tweek' (as in optimize) each stage for peak performance. That's a problem that needs to be solved since virtually nobody building from a kit could be expected to have access to 4 GHz noise and gain measurement equipment.

What else do we need? Volume production. The capacity to turn out no fewer than 500 private (as in low cost) complete terminals **per week**, as an industry, to be stepped up to 1,000 per week by early in 1981. If we can get the equipment into the marketing stream, it will sell and sell well. Finally, we need to recognize that satellite TV is an international phenominon, not purely a U.S./Canada development. And that says anyone getting into the hardware game had better be prepared to sell off-shore as well as here in North America. How all of this develops in the next six months will be fascinating indeed.

COOP'S SATELLITE DIGEST (Technology Edition) is produced monthly by Satellite Television Technology, P.O. Box G, Arcadia, Oklahoma 73007 (405-396-2574). CSD is available in two separate editions (Technology and Programming) or as a combined subscription. Subscription rates are $30 per year for first class mail delivery within U.S.A. or Canada for either edition, or $50 per year for the combined editions. Outside U.S.A. add $25.00 per year for any subscription. All subscriptions to be paid in advance in U.S. funds drawn on a U.S. bank; no invoicing. Contents are copyright 1980 © by Satellite Television Technology and any duplication or reproduction in any form without written permission is a violation of Federal Statue (17 USC 101 et seq.).

ENGINEERING THE PRIVATE TVRO SYSTEM

INTRODUCTION

The Washburn TVRO receiver is an evolutionary update of the Howard Terminal receiver and was conceived to provide a unit that operates as virtually a consumer appliance with the following significant operational features:

1) **Distributed construction**...utilizing an out-of-the-way downconverter (mounting separate from the demodulator proper) with an LNA power supply, a feed rotation system (to allow operational remote control of the feed point antenna for separate reception of vertically and horizontally polarized transponders), a small demodulator console with full provisions for constant monitoring of the system performance, and, a hand-held remote control that allows the viewer to adjust the system to each of the 24 channels found on SATCOM birds (or alternately 12 on ANIK, WESTAR birds) with a remote volume control. This design allows operation by a non-technical viewer without the requirement for special instructions.

2) **Extended Threshold**...a state of the art approach to threshold extension that allows sparklie-free reception of program material with CNRs of 8 dB and above, achieved with-**out** compromises in IF bandwidth, video bandwidth and with special design attention to maintaining video phase and amplitude linearity as one would expect to find in a high dollar commercial receiver package.

3) **Low distortion audio**...a unique approach to recovering **all** of the audio bandwidth present on the satellite transmission utilizing a true low-distortion, low-noise, high-fidelity audio output with remote volume control and **automatic selection** of either the 6.2 or 6.8 MHz sound subcarriers; with indicators to show which audio subcarriers are present and a priority selection system so that the presence of some other modulation format (such as slow scan video) on 6.2 MHz will not be selected for listening (but a **normal** audio modulated subcarrier on 6.2 MHz on a different transponder **will** be heard). Additionally, CCIR (or ANIK) subcarrier frequencies different from the normal 6.2 and 6.8 MHz North American DOMSAT birds can also be received and de-emphasis supplied by component value changes.

4) **An AFT that works**...as well as the RCA home receiver Colortrak® system and provides a very high overall level of dispersion cancellation, eliminating any need for a complex and expensive frequency synthesis system.

5) **VTR compatible inputs and outputs**...to provide easy back-feeding of a home (or neighborhood) MATV system, plus simple off-bird-recording without additional switching or complex cabling.

6) **Careful component selection**...with attention to balancing costs, performance, reliability, ease of alignment and parts availability.

THE WASHBURN TVRO RECEIVER MANUAL

This month Satellite Television Technology begins distribution of a brand new do-it-yourself manual for the low-cost TVRO receiver industry and enthusiast. The **Washburn High Performance TVRO Receiver Manual** is evolutionary in every sense. Engineer Clyde Washburn began his design work with the Howard Terminal receiver having obtained an early copy of the original paper from Tay Howard nearly one year ago. With that design as a starting point Washburn has carefully worked out receiver refinements and improvements which we feel substantially improves the performance of the very popular Howard Terminal designed receiver. Among other things, Washburn has broken the package into three separate, inter-connected modules. The downconverter is separate from the demodulator so that it can be placed at a remote location (such as the building entry point). The demodulator has built-in status monitoring including signal strength monitoring. The demodulator has been designed to produce an 'extended threshold' so that carrier to noise (CNR) ratios as low as 8 dB provide sparklie free reception of program material. The receiver features automatic control of both transponder selection, aural subcarrier selection (6.2 or 6.8), and, antenna polarization selection from a small handheld remote control box. Extras include built-in provision to feed VCR decks and backfeeding of a (local or neighborhood) MATV system.

The manual is being introduced at SPTS '80 Miami. It too is evolutionary. All material has been typeset, all drawings have been professionally 'penned' and schematics are on large fold-out pages where required. And for the first time a complete set of **circuit boards** plus complete or partial parts kits (buyer option) are available from an established source to back up the manual. Additionally, the manual includes complete **PC board layouts** and line drawings showing component part locations. **Step by step alignment** instructions are also provided.

The Washburn Manual is extremely comprehensive. In many ways it is a text designed as much for education in the basics of TVRO reception as it is a text for duplication of a highly innovative, high-performance receiver. This **CSD** feature is a small portion of the introductory 'learning text' found in this new manual.

7) **Automatic and precise**...feed rotation control using a readily available, modest-in-cost (TV) antenna rotor assembly.
8) **Readily available boards and parts kits**... recognizing that many satellite TV enthusiasts have been hampered in their efforts to construct or acquire their own home satellite terminal by the general shortage of specialized component parts required for many receiver designs, and an even more acute shortage of circuit boards for receiver construction by non-design-engineers, every portion of this receiver is backed up by component parts sourcing **and circuit boards**. Additionally, the user of this manual will find circuit board layouts in this manual with which he may duplicate his own boards if he so wishes.

WHAT SIZE ANTENNA DO I NEED?

The Washburn receiver was originally designed for use with a 10 foot (39.3 dBi gain) antenna and a 120 degree Kelvin (K) LNA in a location penalized by what must be characterized as a 'very low elevation/look angle'. At the time of the basic receiver design RCA F1 was purported to be placing a 36 dBw footprint into western New York. Based upon these known (or believed) figures it seemed like a good idea to design the complete system so that it would exhibit the same (commercial as in CATV) ''3 dB excess carrier margin'' established for cable systems by the FCC. The original calculation therefore looked like this:

Bird EIRP-Path loss + Ant Gain = LNA input dBw

36 - 196.55 + 39.3 = -121.25dBw

To calculate the expected CNR (carrier to noise ratio):

(T° LNA + T° Ant) x Boltzman's Constant x I.F. Noise bandwidth = Equivalent LNA Input Noise in dB

$(120 + 50) \times 1.381 \times 10^{-23} \times 30 \times 10^{6} =$ -131.52 dBw

CNR = LNA input dBw - equivalent LNA input noise in dBw

CNR = (-) 121.25 - (-) 131.52
CNR = 10.30 dB

The original receiver design goal called for a 7.3 dB CNR **threshold** which correlated with the magnitude of improvement suggested in the 'theoretical' literature for an **optimum** PLL vs. a (frequency) discriminator circuit under similar conditions. The final system, described here, courtesy of the **actual** 34 dBw region EIRPs which SATCOM F1 is now known to have (versus the earlier RCA data on file with the FCC which promised a 36 dBw EIRP for the northeastern area of the United States), provides measured CNR levels of 7.4 to 9.1 dB across the various transponders (3). At CNRs of 8 dB and above sparklies have been observed only on saturated color bars and these sparklies are not apparent for normal program transmissions. Video SNR should be very close to or above 45 dB at the 8 dB CNR level. Studies by TASO (Television Allocations Study Organization) equate this type of video SNR to a rating of ''Excellent'' by 70% of the viewers (tested) and ''fine'' by 99.8% of the tested viewers. In ''eyeball terms'' this translates to ''some visible grain'', inferior by comparison to direct line of sight VHF-UHF reception (4) but ''viewable without annoyance or any sense of loss of detail''. If you are a very critical viewer and/or use a projection television receiver system you may risk some disappointment if the SNR delivered to your receiver is below the 51 dB video SNR routinely supplied by cable operators (5). A 51 dB SNR translates to a CNR of 14 dB and is TASO rated as ''Excellent'' by 95% of all tested viewers.

If we are to look ahead to the eventual launch of SATCOM FIV and believe the pre-launch footprints supplied by RCA for their aborted attempt to launch FIII (which one assumes FIV shall replace), we can anticipate a range of EIRPs from 33.7 to 36.7 dBw across the major portions of North America (**see figure 6**). Similarly, if one is located where the present ANIK-B service is rated as 36 dBw or better (generally speaking north of the 40th north parallel), or is located where COMSTAR or WESTAR footprints are believed to be in the 34-37 dBw region (see **CSD** for December 1979), one might target 3 CNRs of interest as follows:

1) **8dB CNR** = marginal reception (at or just below threshold), lowest cost system
2) **11 dB CNR** = standard system margin (i.e. 3 dB built in for system 'aging')
3) **14 dB CNR** = highest quality picture (i.e. 51 dB SNR or better, 'studio quality')

Here the system figure of merit (or G/T°) is useful for evaluation of various antenna/LNA combinations. We are, afterall, determined to produce the best possible picture(s) within some constraints of budget, antenna-space-available and neighborhood aesthetics.

---

3) **RCA found during the summer of 1979, through tests conducted by COMPUCON, that their EIRP levels for both SATCOM FI and FII birds were from 1.5 to 3 dB** below **their anticipated levels with the most severe reductions throughout the eastern U.S.**
4) **Line of sight VHF-UHF reception assumes consumer standard receivers and no excess of man-made noise level interference present at or near the off-air receiving site.**
5) **Cable operators may in fact attain video SNRs of 51 dB** (or better) **at their TVRO receiving sites but seldom deliver SNRs in excess of 45 dB to any customers because of cumulative noise and distortion products inherent in any cascaded broadband VHF distribution system.**

$$G/T° = \frac{\text{Antenna Gain}}{\log(\text{effective antenna} + \text{LNA temperature})}$$

From the first calculation example we can see that a 39.3 dB(i) (7) antenna produces a G/T° of 17.6 with a 170 degree (T°LNA + T° Ant) system noise temperature and a CNR of 10.3 dB results. The 'figure of merit' remains a constant for any given antenna/LNA combination and CNR will track EIRP on a dB for dB basis.

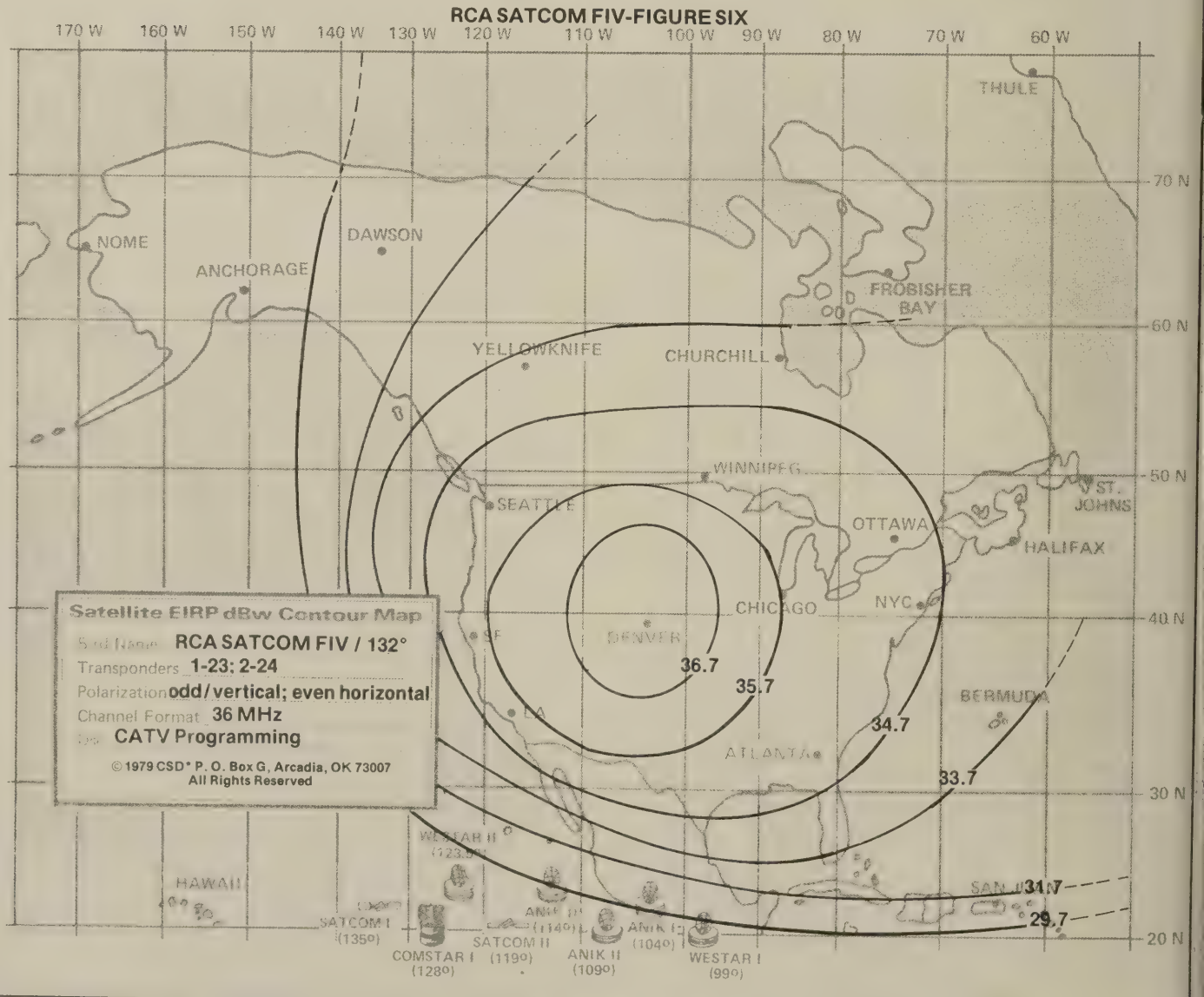
Thus: G/T° + EIRP - 43.3 = CNR

Now if we can quantify the performance of various antenna sizes as follows we have the makings of a system performance evaluation table:

6 foot aperture = 35.0 dBi
8 foot aperture = 37.5 dBi
10 foot aperture = 39.5 dBi
12 foot aperture = 41.0 dBi
15 foot aperture = 43.0 dBi
20 foot aperture = 45.6 dBi

Knowing then what our antenna gain is (thought to be), knowing what our EIRP signal level is (thought to be), we can then mathematically determine what our system noise temperature (antenna noise temperature **plus** LNA noise temperature) must be to achieve various levels of performance or service.

Antenna Size	EIRP LEVEL	8 dB	11 dB	14 dB
6'	33.7dBw	57.5°***	40.7°***	28.8°***
	34.7dBw	72.4°***	51.2°***	35.5°***
	35.7dBw	91.1°***	64.5°***	44.7°***
	36.7dBw	115°***	81.2°***	56.3°***
8'	33.7dBw	97.7°***	69.1°***	48.8°***
	34.7dBw	123°**	87°***	61.5°***
	35.7dBw	155°	109°***	77.4°***



	36.7dBw	195°	138°*	97.5°**
10'	33.7dBw	155°	110°**	77.4°**
	34.7dBw	195°	138°*	97.4°**
	35.7dBw	246°	174°	123°*
	36.7dBw	309°	219°	154°
12'	33.7dBw	219°	155°	109°**
	34.7dBw	276°	195°	137°
	35.7dBw	347°	246°	173°
	36.7dBw	437°	309°	217°
15'	33.7dBw	345°	245°	173°
	34.7dBw	434°	308°	218°
	35.7dBw	547°	388°	274°
	36.7dBw	688°	489°	345°

Antenna temperature is a function of many factors including the design of the feed, the **type** of feed employed and how it is employed, and the elevation or 'look angle' of the antenna. In the mid-atlantic states north along the eastern seaboard into the Canadian Maritime Provinces, and in the Caribbean east and southeast of Miami, the location of RCA's FI satellite (135 degrees west) produces a very low 'elevation' or look angle for your antenna. As the antenna comes closer and closer to the horizon (i.e. ground) to the west/southwest to boresight upon FI the antenna begins to 'see' the earth itself as a noise source. It is not possible to accurately stipulate the antenna noise temperature for **all antennas** of a specific size for **all locations** but for a common prime focus fed antenna with a look or elevation angle in the 12 degree or lower region the antenna temperature may be approximated as follows:

Antenna Size	Antenna Temperature (degrees Kelvin)
6'	70 degrees
8'	58 degrees
10'	50 degrees
12'	44 degrees
15'	40 degrees

In the midwest and further west (and south) where the elevation/look angle rises simply because the bird is now higher in the sky the antenna temperatures under the above conditions can be approximated as follows:

Antenna Size	Antenna Temperature (degrees Kelvin)
6'	36 degrees
8'	32 degrees
10'	29 degrees
12'	26 degrees
15'	24 degrees

Since our system noise temperature is a composite of the LNA noise temperature **and** the antenna noise temperature and we can now see that our antenna contribution is largely beyond our control (having been determined by where we live and the antenna size chosen plus to some small extent the type of feed with the antenna), what about the contribution of the LNA? It would appear that the minimum practical LNA temperature (or noise temperature/factor if you identify with this nomenclature) is in the 85 degree K(elvin) region for the immediate future; and this is available only at a staggering cost (8). We can therefore, in our composite table of antenna sizes vs EIRP levels, eliminate any case where the required **total system temperature** is unattainable in the (north)eastern United States (and the far southeast such as Florida, the Caribbean, Bermuda and the northeastern portions of Canada)...indicated by a **single asterisk** (*), or, throughout the same area as well **plus** the midwest, south and southwest...indicated by a **double asterisk** (**).

Clearly the 6 foot size parabolic antenna is unworkable virtually anywhere for a serious viewing system (9). If an absolute minimum size antenna is important (because of neighborhood restrictions, lot size problems, etc.) and cost of the total system is no object (i.e. you are prepared to spend whatever is required for the LNA), the three identified levels of performance could be obtained as follows (**with an 85 degree K LNA**):

Marginal - 8', except 10' in the south and New England

Standard Quality - 10', except 12' in the south and New England

High Quality - 12', except 15' in the south and New England

Since the current 'sweet spot' for cost/performance in commercial LNAs is at the 120 degree K point, an optimum cost fully purchased system might be (**with a 120 degree K LNA**):

Marginal - 8' midwest, 12' south and New England, 10' elsewhere

Standard Quality - 10' midwest, 15' south and New England, 12' elsewhere

High Quality - 12' midwest, 20' south and New England, 15' elsewhere

---

7) **Most [but not all] parabolic antenna suppliers measure the forward gain of their antennas in the maximum lobe as a function of 'gain over and above' an isotropic source** (i.e. i). **An isotropic source is a mathematical 'reference antenna' that does not exist in the real world; generally it is said to have 2.1 dB** less gain **than a simple dipole mounted in 'free' space. References here are in dBi; antennas referenced to a dipole would be in dBd** (d indicating gain above a reference dipole in free space).

8) **While prices change rapidly in the commercial LNA field, an 85 degree 'guaranteed' LNA is typically in excess of $5,500.**

9) **An exception might be reception from Canada's ANIK-B on 4 GHz in central Canada where an EIRP of 38 to 39 dBw is quoted by Telesat Canada.**

If you have acquired this manual with the serious intent of constructing your own TVRO terminal electronics (including the LNA) you might be wondering what you can expect with a bi-polar type (HXTR 6101) LNA of your own construction married to the receiver described here:

With a homebrew **275 degree K** LNA...
Marginal - 15' south and east, 12' others
Standard Quality - 20' south and east, 15 foot elsewhere
High Quality - 15' in midwest only around boresight (see figure 6), 20 foot elsewhere except south and east; not practical there.

Those considering use of the Swan Spherical or other sizes of antennas can readily make the same comparisons by appropriately substituting the gain of the proposed antenna and the effective noise temperature of the antenna in the above calculations. (10)

At this point one can determine the best trade off(s) in cost, performance and mechanical problems associated with antenna size (mounting, foundations, wind loading, etc.) and reach some logical conclusions about how your own system will go together.

HOW MUCH LNA GAIN DO I NEED?

The Washburn TVRO Receiver provides a fairly typical noise figure of 13 dB. What does this mean? Simply that an input signal will have added to it noise at a level 13 dB above thermal (which is usually assumed to be 290 degrees Kelvin), or 5800 degrees K. Note however that at the same point the effective noise temperature of the antenna will have been **amplified** by the LNA gain, minus feedline (LNA to receiver) losses. In a complete system, therefore, the 'true' antenna noise temperature is actually:

$$T°Overall = T°LNA + T°Ant + \left(\frac{T° \text{ Receiver}}{\log^{-1}(\text{G-LNA} + \text{Feedline loss})} \right)$$

Clearly, since LNA temperature reduction below the 'sweet point' is so expensive and bulk LNA gain less so, it would be imprudent to allow the receiver to add more than perhaps 5% (preferably 1%) to the overall system temperature. With the assumptions of the standard margin (11 dB CNR where 8 dB CNR is considered to be the FM threshold for visible sparklie noise) and an eastern or southern location (where one wants to give up little in system temperature because of antenna noise contributions which cannot be avoided with smaller sized antennas), the minimum net gain from antenna input to receiver input for typical LNA noise temperatures would be:

LNA T°	5% Overall Degradation	1% Degradation
85	29.3 dB Gain	36.3 dB Gain
100	29.1 dB Gain	36.1 dB Gain
120	28.5 dB Gain	34.1 dB Gain
180	27.1 dB Gain	34.1 dB Gain
275	25.7 dB Gain	32.7 dB Gain

If you select a standard **commercial** LNA with **50 dB plus of gain** (55 dBg typical) you will be in an overkill situation for nearly any feedline and should seriously consider either RG-214 at -23.5 dB per 100 feet (therefore with a commercial LNA good for up to approximately 80 foot runs) or for short runs RG-223 at -43.5 dB per 100 feet (therefore useable for a run to approximately 40'). Why throw dBs away? Because excess gain will do you no good and may even require a receiver input pad with the higher EIRPs and larger antennas (see Down-converter Theory and Operation, in this manual).

''Designed for private'' and home-brew LNAs should be chosen to allow a minimum of 25 to 30 dB gain (dBg); with noise temperatures of 275 to 85 degrees K respectively, at the receiver input, both for the overall noise considerations discussed here and to insure adequate signal to the video detector in the receiver proper.

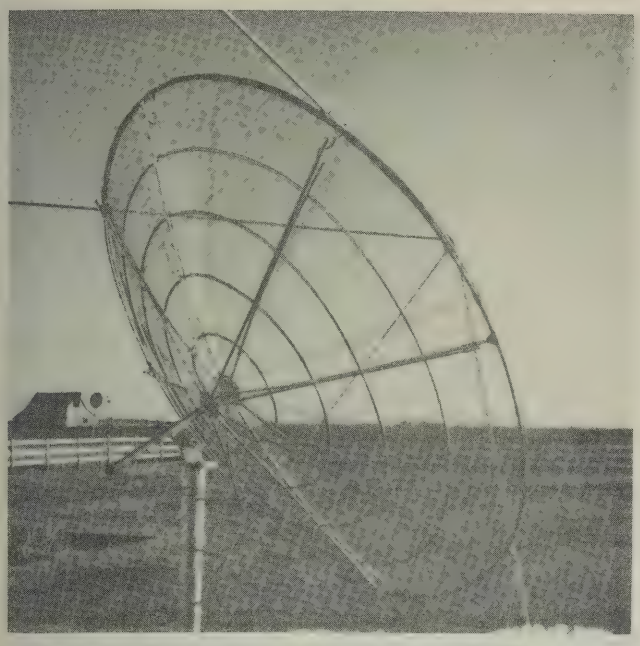
10) **The real-world noise temperature of a Swan Spherical TVRO Antenna is a subject for some debate at the present time. It is probably higher than an equivalent sized parabolic for** low **look angles.**

REPORT ON HOMEBREW TVRO ANTENNAS

SPRINGING UP ALL OVER

Apparently not everyone feels handicapped by not being able to walk into the nearest Radio Shack and head home with an inexpensive satellite TV antenna. We've been collecting photographs of home construction (or home installed as in found-in-surplus and brought home for re-conditioning) of various types of designs of home TVRO antennas for several months now. And the file is overflowing. Here is what a **few** of the pioneers are doing for antennas these days.

James Burkett of Breckinridge, Oklahoma built up a 10 foot reflector surface with a 60 inch (f/D of .5) focal length. Depth of the dish is 15 inches. The materials are 1/2 inch conduit covered with 1/8th inch hardware cloth. Other materials included (2) 4 inch floor flanges, a 5-inch (1-1/4) nipple and a pair of 6 inch by 1/4 aluminum plates. The parabolic shape was

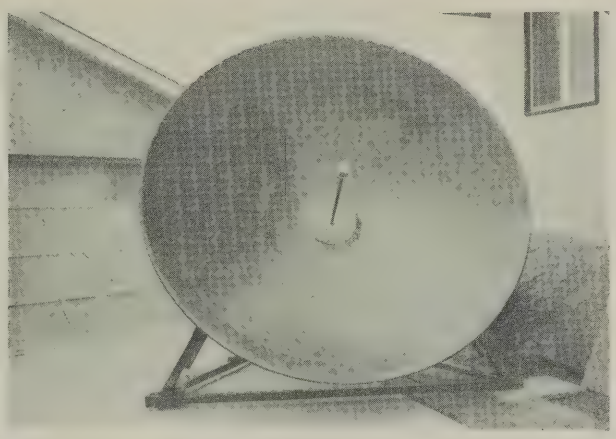


Jack Burkett's home brew conduit-rib 10 footer

laid out with 6 inch squares on a piece of plywood and the half inch conduit was bent to fit the parabolic shape on the plywood with a conduit bender. The outer circle seen in the photos has a pair of half inch conduit pieces bolted together with 8:32 hardware. The 1/8th inch hardware cloth is first tied in the center and the outer edge and then pulled down tight to each inner circle with #16 wire every six inches. The mount is constructed from 4 inch oil field casing pipe, 9 feet long. Inside of this is a two inch pipe that turns in 3/8 inch steel 'doughnut holes' welded at the top and bottom.

Ingenious and low cost.

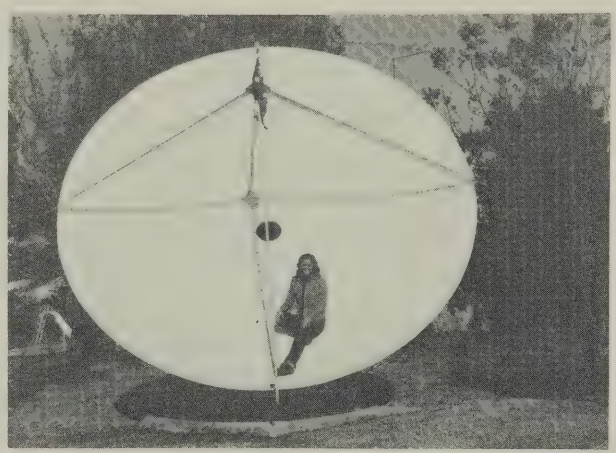
Rene A. Matthijssen (RR #1, P. O. Box 576, Marinville, Alberta TOG /PO Canada) went home from SPTS '79 in Oklahoma where he reports "I learned a lot". He has rounded up some surplus WR-229 waveguide to go with his surplus dish (see photo here) and he is willing to share the waveguide with others (we assume Canadians only should contact Rene since



Rene Matthijssen's surplus dish and homebrew mount

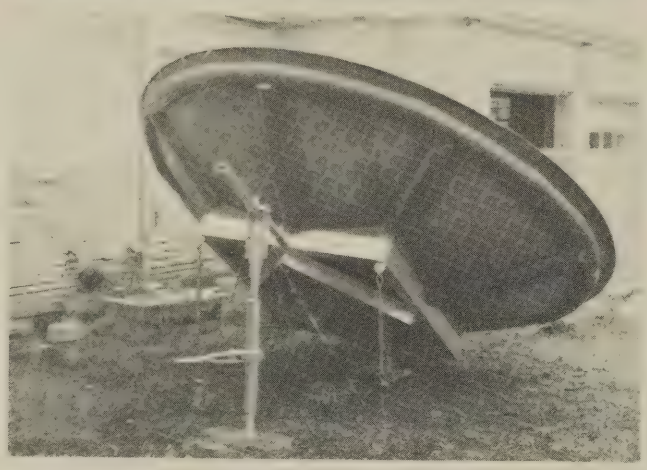
shipping waveguide across the border may be quite a hassle with the customs folks). He suggests building up a feed horn per the instructions found on page T8 of the November 1979 **CSD**. His antenna mount is simple but effective as the close up photo shows. Rene also notes that "surplus antennas are getting very scarce here undoubtedly due to the sudden interest in TVROs by hundreds if not thousands of Canadians". Send us some **construction details** of your WR-229 conversion to feedhorns Rene!

A couple of months ago a young couple from eastern Oklahoma dropped into the STT Lab Site in the midst of an unseasonable fall thunderstorm looking for information about construction of a satellite home system. Jack and Melissa are in the fiberglass boat business and they live in an area where they receive only a single television station. Jack felt that if he could mold fiberglass boat hulls he could also put together a fiberglass TVRO antenna. We encouraged him to try and less than five weeks later the photo here was taken. That's Melissa with the dish which looks like a dandy 15 footer. In fact Scientific Atlanta had better watch out if Jack ever tires of the boat business!



Melissa with the dish Jack built

If all of this talk of home brewing your own antenna has you intrigued, you might want to investigate a couple of relatively low cost commercial antennas which are now being produced in the southern midwest. **Randel Odom** (Route 1, Box 347, Beebe, Arkansas 72012; 501-882-5756) has a ten foot reflector surface molded out of fiberglass which he sells for $850 FOB Beebe. In the two photos here we see this antenna installed at the home receiving site of Lindsey Riddle of New Orleans. Lindsey used a length of airplane cable with turnbuckles on a 'steamboat rachet' because he had some



Randel Odom's ten footer installed in New Orleans

'play' in the screws. He found the rachet for $25 in a junk yard in New Orleans and reports several more are available at the same place. In the second photo we see the Odom ten foot dish mounted on Lindsey's homebrew mount.

Another antenna now being manufactured and sold in the same area is the 10 foot parabolic reflector that is built in quarter sections by **Mini-Casat** (2107 Forrest, Tupelo, MS 38801; 601-842-8617). The price is $520 FOB Tupelo and the antenna does not include a mount nor a feed. Construction is with fiberglass sandwiching screen wire and the antenna does have flanges on the back for attaching your own mounting system. Present production capacity is around 15 antennas per month.

With the death of Oliver Swan on Christmas eve many have asked what will happen with the various agreements and production facilities set up to produce the Swan Spherical TVRO Antenna. As most readers know, Oliver developed the antenna over an extended period of time (see **CSD** for November 1979, page P2) and had authorized his brother Henry to produce the antennas commercially from a facility established in Stockton, California (**Swan Antenna Co.**, 2202 Hollywood Drive, Stockton, CA 95210; 209-948-5254). Oliver had also reached agreement with Cliff Gardiner of Gardiner Communications Corporation to produce the antennas for the cable and commercial markets although Henry Swan advises us that as of early January the final format of the Gardiner agreement had not been reduced to paper for both sides to sign. The assumption at this point is that Gardiner will be moving ahead with a commercial version of this innovative antenna.

Henry Swan meanwhile continues to produce the Swan Spherical type antenna in two formats. A 14 foot version which includes mounting brackets and the feed horn created by Oliver sells for $3100 **list** price FOB Stockton. A five meter (roughly 16.25' aperture) sells for $3600 **list** price. Both are FOB the Stockton plant and there are some dealer discounts available for **legitimate** installing dealers. Henry Swan will be spending considerable time in Bisbee for the next few weeks attempting to straighten out the cable systems owned by Oliver and his wife at the time of Oliver's death. He asks that those who have made query about being licensed to build the Swan Spherical on a regional basis hold off recontacting the family for the time being. If you are interested in purchasing small quantities of the antennas for personal or resale use you can contact Alan Swan at the Stockton telephone number given here.

Gene Marygold and his shrouded dish

And finally for this report here is one man's approach to shielding his prime focus fed antenna in what must be a high signal area for interfering signal sources in the 3.7 to 4.2 GHz region. That's **Gene Marygold** with his rotor equipped feed working on his newly installed dish at his Vista, California location. In commercial installations 'shrouding' such as you see around Gene's dish is fairly commonly employed to insure that stray signals coming at the feed from side angles do not get into the system. We'll have a report on designing and building your own shroud in a subsequent issue of **CSD**.

FOR YOUR EARTH STATION, CHOOSE

AVCOM'S PSR-3

SATELLITE VIDEO RECEIVER

DESIGNED FOR YOUR PRIVATE TERMINAL

- Remote tuning
- Dual video outputs
- Exclusive Clamp-Sync & Scan-Tune
- Many other features!

AVCOM of Virginia, Inc.
10139 Apache Road, Richmond, VA 23235
(804)320-4439

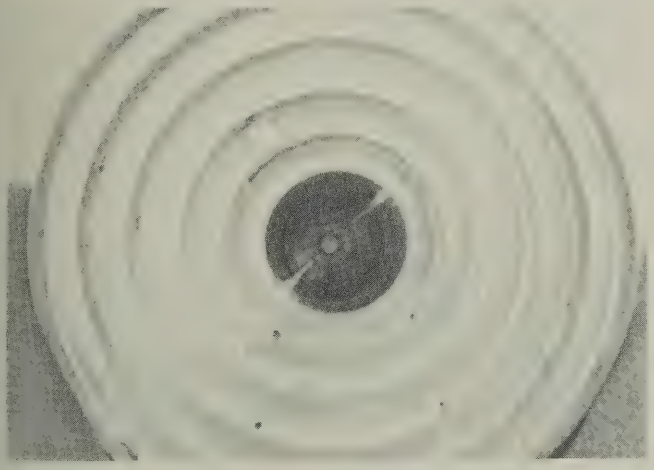
SMALL TERMINAL ANTENNA NOTES

BIRKILL HYBRID MODE RE-VISITED

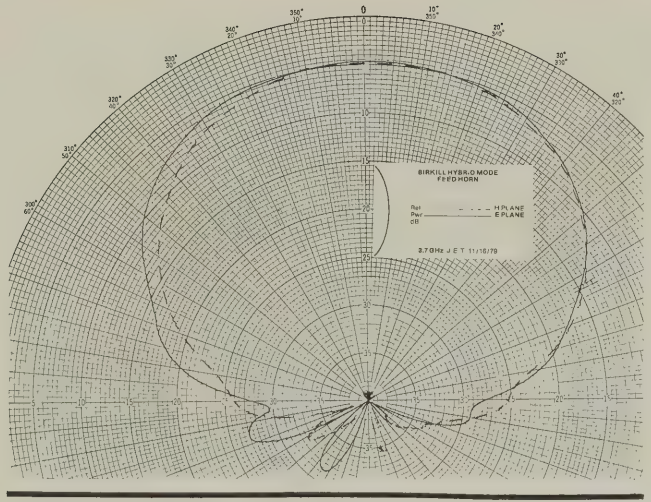
With interest in experimental reception from INTELSAT or STATSIONAR satellites growing, it may be time to re-visit the Birkill 'Hybrid Mode Feed' originally described in the February 1979 issue of CATJ Magazine [*]. Small system enthusiast Jack Trollmann of Mountain View, California recently constructed the Birkill feed and with the equipment available to measure the effective pattern of the feed he provides the following data:

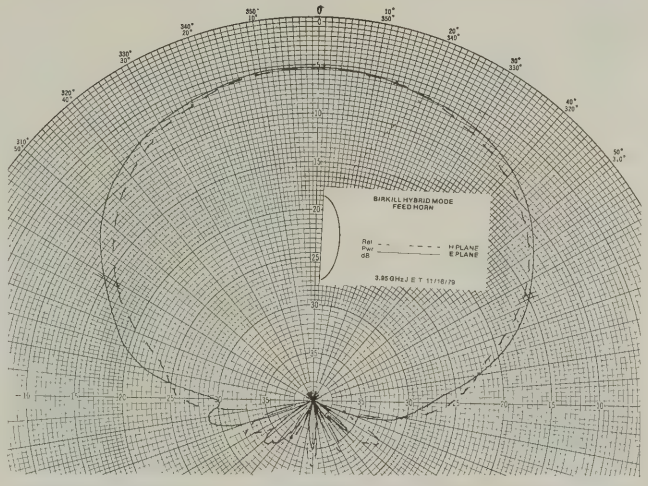
The radiation patterns for the Birkill feed were measured at 3.7, 3.95 and 4.2 GHz. E plane is shown on the solid trace while H plane is shown on the horizontal trace.

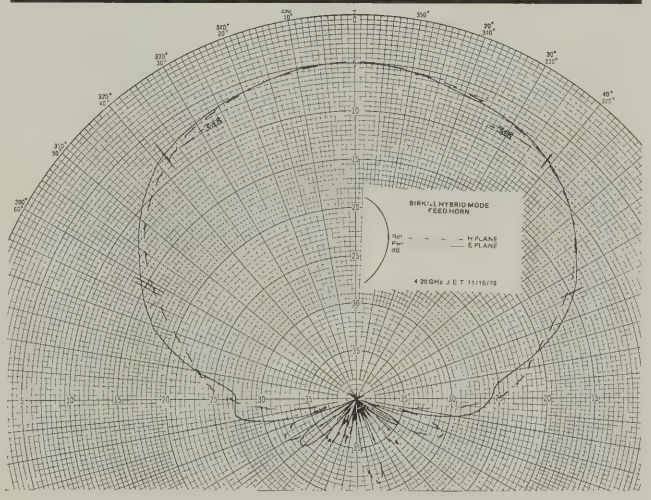
1) The E and H plane beamwidths are nearly identical for all three frequencies. This is desireable since it results in a uniform illumination of the reflector surface which in turn maximizes the aperture efficiency.
2) The patterns remain uniform across the band. While only three points were actually measured it is very unlikely that any noticeable deviations from the three patterns would take place.
3) From the feed horn design curves in **Jasik** [**] the optimum f/D ratio this feed should be used with is 0.47. This is based on a -10 dB edge (of reflector surface) illumination for maximum gain and **includes** the space attenuation effect resulting from the edge of the reflector being further from the feed horn than the surface directly in front of the horn. This value of f/D is the center of a rather flat efficiency curve so the feed can be used with other ratios with only tenths of a dB sacrifices in G/T.



BIRKILL HYBRID/CORRUGATED FEED head on. Thin brass sheet, 7/8ths inch 'tall', form the circular 'walls' that circumference the base plate. Birkill utilized a 9 inch disc of double sided copper clad PC board material for his rear plate.

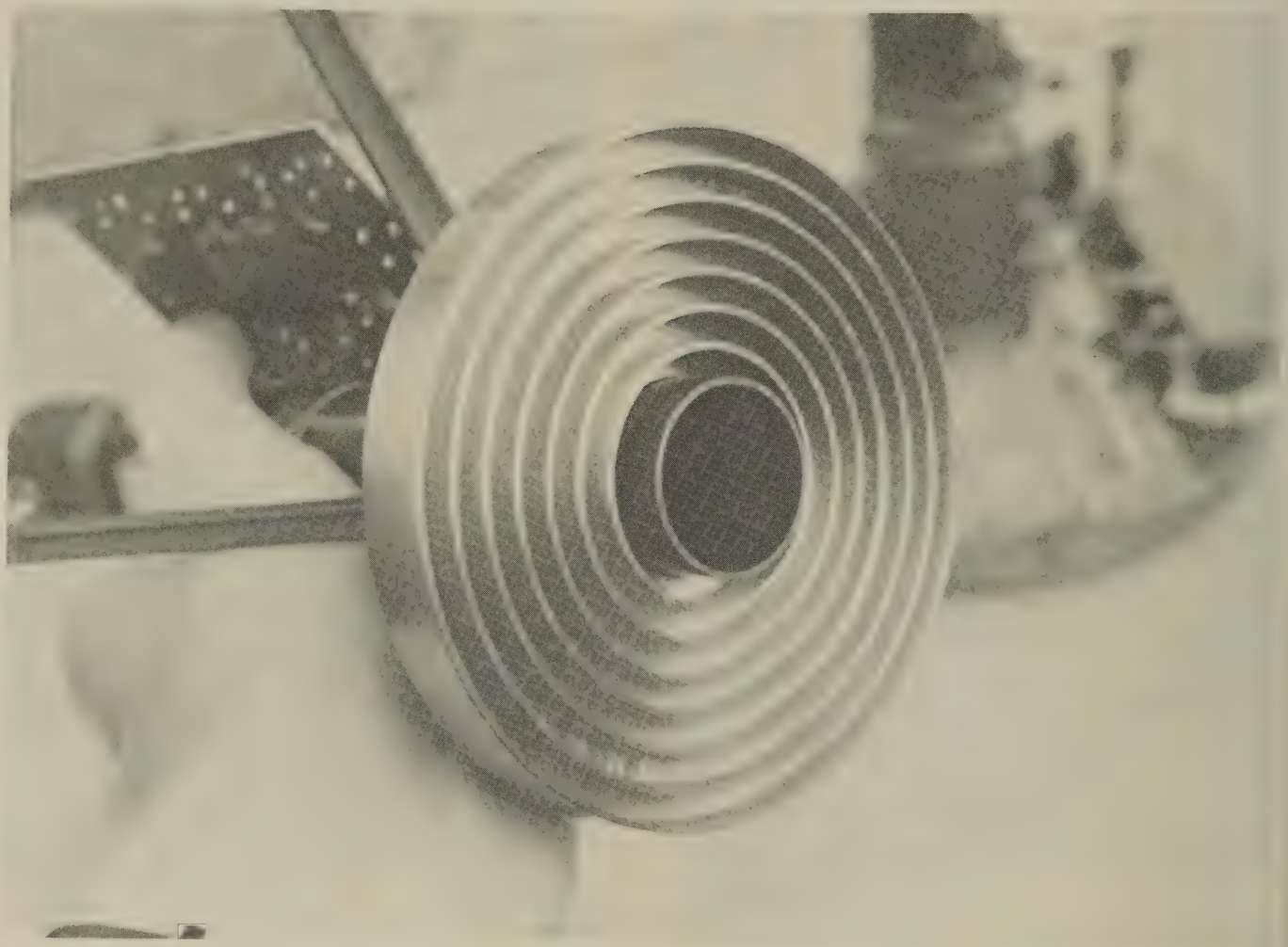




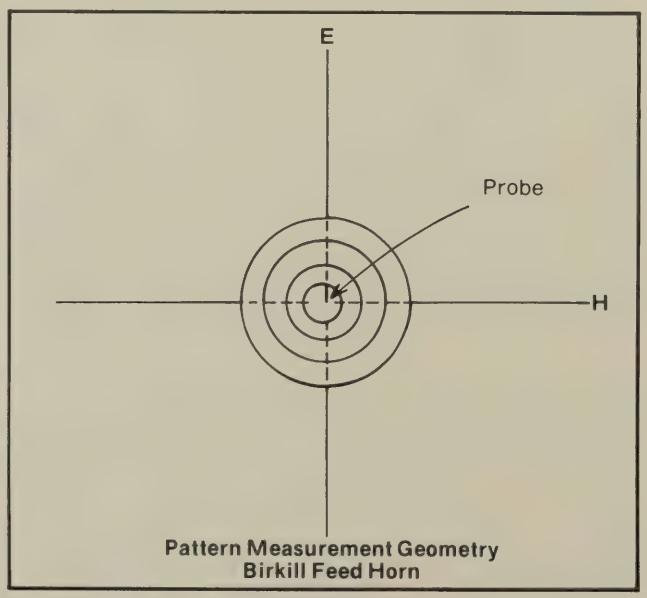


Jack also notes "This horn is probably the best performing per unit of construction difficulty currently around. It took me about five hours to construct and $8 worth of materials." Jack continues other testing on the Birkill Hybrid Mode Feed including VSWR measurements.

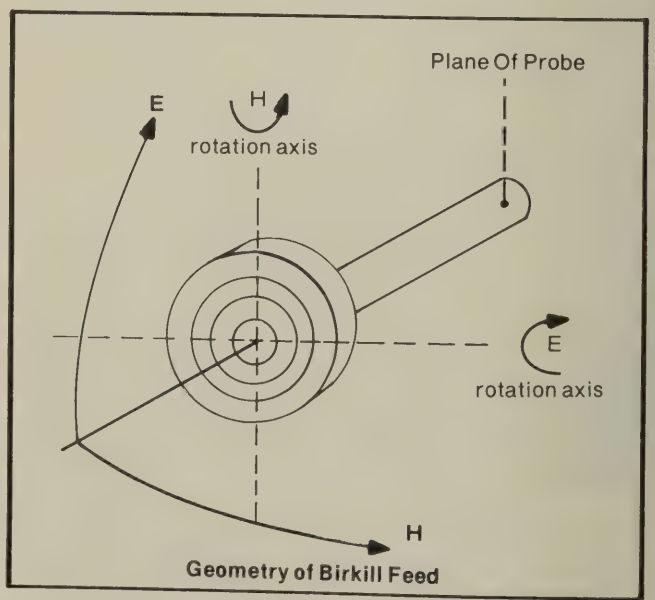
Birkill developed the feed to satisfy his special requirements in the U.K.; he presently receives both linear and circular polarized signals from domestic and international grade satellites.



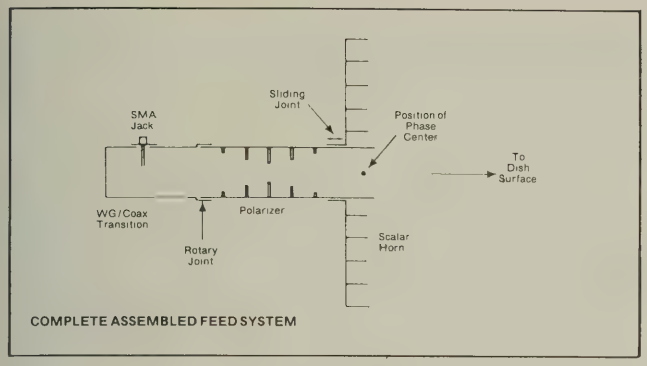
CORRUGATED FEED mounts on a sliding joint to 2 inch waveguide section and adjusts for proper 'phase center' [see diagrams].



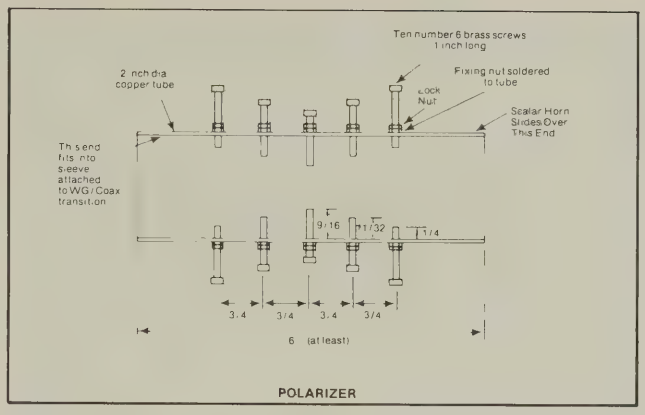
**Pattern Measurement Geometry
Birkill Feed Horn**



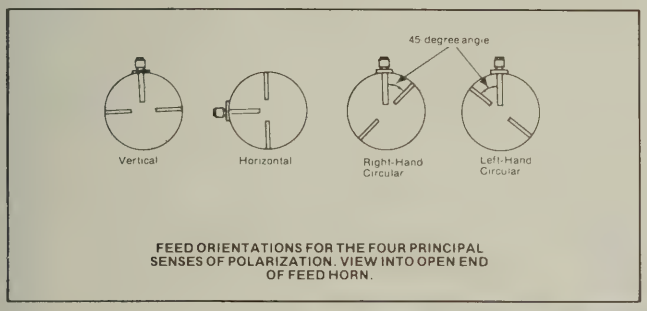
Geometry of Birkill Feed



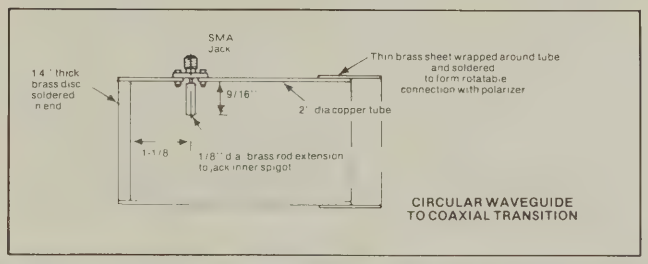
COMPLETE ASSEMBLED FEED SYSTEM



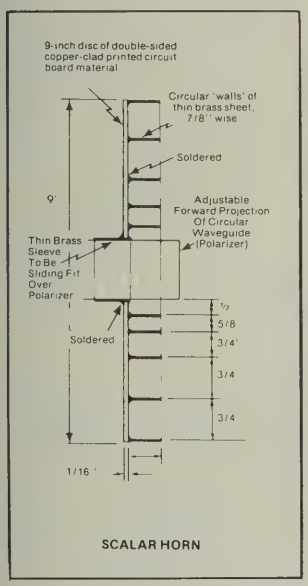
POLARIZER



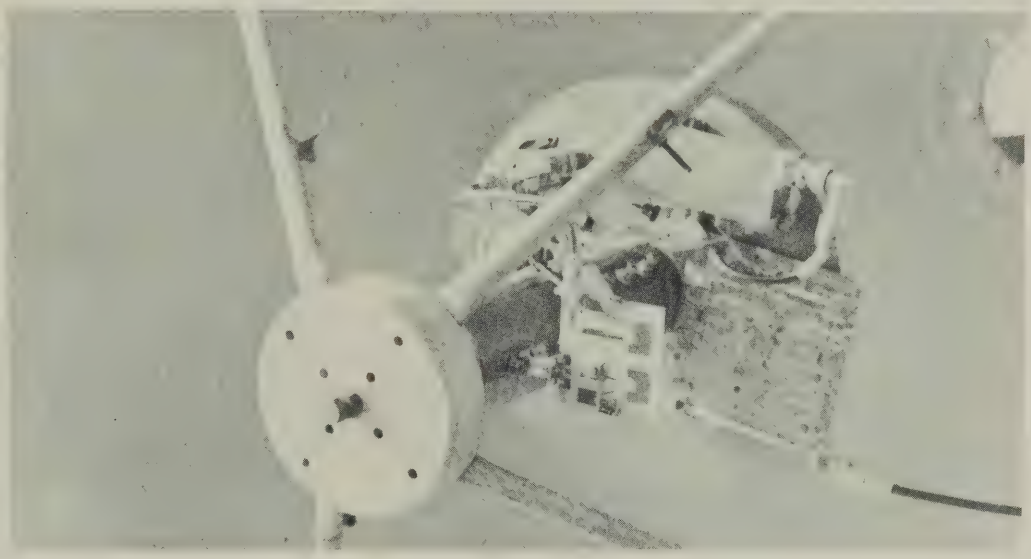
FEED ORIENTATIONS FOR THE FOUR PRINCIPAL SENSES OF POLARIZATION. VIEW INTO OPEN END OF FEED HORN.


SMA Jack
Thin brass sheet wrapped around tube and soldered to form rotatable connection with polarizer
1/4" thick brass disc soldered on end
9/16"
2" dia copper tube
1-1/8"
1/8" dia brass rod extension to jack inner spigot

CIRCULAR WAVEGUIDE TO COAXIAL TRANSITION



SCALAR HORN



REAR OF BIRKILL FEED houses, in his case, the 4 GHz, high LO and UHF region region receiver i.f. electronics. Two inch diameter copper tube 'waveguide' can be slid in and out for maximizing the focal point position of the feed reference the reflector surface.

The antenna consists of a scalar horn with a sleeve that attaches to a 2 inch diameter copper tube which acts as a section of circular waveguide. The copper tubing/waveguide is outfitted with a quantity number 6 brass screws which are positioned as indicated here to form an adjustable polarizer. The polarizer when properly adjusted introduces a 90 degree (differential) phase shift between horizontally and vertically polarized waves. When we have a plane (i.e. non-circular) polarized wave passing through the polarizer at 45 degrees, it is converted to a circularly polarized wave with the 'sense' of rotation depending upon the direction the initial 45 degree rotation is applied (see diagram). In a similar fashion, circular polarization is converted to plane or linear polarization. For a given orientation of the polarization two sense of circular polarization will create either horizontal or vertical polarization out of the polarizer. An orthongonal mode coupler (see diagram) will allow you to recover both sense of plane polarization simultaneously. If you don't require both senses simultaneously a rotating joint on the circular waveguide will enable you to select either one or the other.

*** - CATJ Magazine no longer makes copies of past articles available. An updated set of construction sketches for the Hybrid Mode Feed appears here.**

**** - See "Antenna Engineering Handbook" by Henry Jasik [McGraw-Hill Book Company, New York; First Edition [1961], pages 12-5 and 12-6.**

LNA DESIGN & APPLICATION NOTES

GaAs-FET HANDLING INSTRUCTIONS

One year ago the non-commercial market for Gallium Arsenide Field Effect transistors did not exist. Today there are sources where 150 degree K devices can be obtained for prices in the under $50 region and $75 to $100 will buy for you a device with a noise figure in the 1 dB region at 4 GHz (around 80 degrees K). GaAs-FET prices are starting to tumble and that means that more and more people are going to get their hands on these tricky little buggers.

Several words of caution about touching, handling, using, poking or showing off these little gems are in order. Even at $50 a piece you don't want to blow up any by careless handling or improper installation techniques.

1) **GaAs-FETs are extremely brittle** and must be handled with extreme care to avoid chipping, cracking or physical damage (i.e. breakage).
2) **When you pick up a GaAs-FET**, the picker-upper (as well as any tweezers or other pick-up tool) should be grounded to the test, assembly or inspection area. This prevents the build-up of a static charge (in the gate area of the GaAs-FET) which can damage the transistor if allowed to pass through the device.
3) **Spurious pulses or spikes or transients** generated by test equipment (such as 'contact bounce' during switching, induced voltage in the leads and so on) cannot be tolerated by the device. Avoid turning the power on and off on the test equipment **or switching between ranges** with measurement equipment (i.e. switching from one voltage range to another with the test gear) **while** the leads are attached to the GaAs-FET. Switch to safety by first disconnecting the test instrument (even digital VOM) from the circuit **before** changing ranges.
4) **Use shielded power wiring cables** and shielded RF signal coupling cables. Inductive pick-up from (switching) power suplies and so on cannot be allowed to get into the leads going to the GaAs-FET.
5) **GaAs-FETs are light sensitive**(!). A bright light shining on the GaAs-FET while you are making (any) measurements will change the characteristics of the device from what they will be when the unit is bottled up inside of a container. There is no hazard here (to the safety of the device); only a warning about measurements.
6) **A GaAs-FET does not like moisture**. Excessive (read **any** visible or apparent) moisture on a GaAs-FET when normal operating voltage is applied will probably cause the device to go west quickly. A long ways west...
7) **Placing bias on the GaAs-FET** must be done in a prescribed pattern. **First** apply the gate voltage and **then** the drain voltage. When removing bias take away the gate voltage **last.**

This set of caveats should (logic suggests) apply to all GaAs-FETs. However they probably do not. Therefore as we become aware of different handling and use precautions for different GaAs-FET devices we will pass them along to you.

The bottom line is don't open up the small plastic container with a GaAs-FET inside and pass the tiny 'piece of gold' around amongst friends. Their body charge and the different potentials between people (plus your own charge) may well blow the device. Remember these sage words of advice from Tay Howard: ''a GaAs-FET is really a very small current fuse in an expensive package...''.

NEW LNA TECHNOLOGY

If there is a 'hurdle' to be overcome in bringing to the marketplace a lower cost LNA for (private) TVRO installations, the input or front end circuit is the most obvious impasse presented. The first thing the 4 GHz signal 'sees' after traveling through the WR-229 waveguide flange at the 'mouth' of the typical LNA is a probe which acts like a 'small antenna' to couple energy out of the waveguide into the LNA proper. Following the probe the commercial LNAs available route the signal through a device known as an isolator. The isolator has several functions in life; it is kind of like a one-way street in that it prevents energy from inside of the LNA from leaking **backwards** out to the antenna surface (from which one can expect that the energy would be focused and radiated back into space), and, it also insures that the LNA input stage has a constant 'load' or source impedance. The latter is important for GaAs-FETs (although not quite so much so for bi-polar stages) since they derive their good low noise operation, and stability, by having a constant input impedance. Without the isolator, current LNA technology has a difficult time maintaining a stable GaAs-FET in the input stage since small physical variations in the feed antenna and even the reflector surface translate back to a changing input impedance to the first (GaAs-FET) stage.

Yet eliminating the isolator (which **also** adds from .15 to .2 dB of insertion loss to the inward bound signal before it is amplified) is desirable. The additional loss of an isolator, plus the expense of the high quality ferrite material internal to the device extracts a toll on LNA design, manufacture and pricing.

SATELLITE TV EXPERIMENTERS
INTRODUCING A COMPLETE
3.7 — 4.2 GHz DOWNCONVERTER
•3.7-4.2 GHz in [illegible] MHz out
•Remote, one [illegible] tuning
•Dual conve[illegible]le
•Assembled [illegible]nly $895.

Polar [illegible] Feed Rotation [illegible] Dish.
St[illegible] tpaid

EXPE[illegible]PPLIES
•Teflon PC B[illegible] ant 2.55
1/16''x9''x3[illegible]
1/32''x9''x4''
•Chip capacitor k[illegible] 18, 27, 39, 220, 4700 pf...
•SMA and microwa[illegible] connectors, inquire
•2''x14'' copper tube for Birkhill feed, 3 lbs. $12.00

WRITE - We are adding to our inventory!

SATELLITE INNOVATIONS
P. O. Box 5673
Winston Salem, N.C. 27103

Add $2.00 shipping and handling (except for plans)

THIS PRODUCT NO LONGER AVAILABLE

Even in very large quantities isolators cost the LNA manufacturer upwards of $100 each and when a manufacturer pays that much for a single 'part' the multiplied cost of the LNA becomes considerably greater.

Work to eliminate the isolator while still maintaining an 'unconditionally stable' GaAs-FET front end continues. When there is a breakthrough here the price on commercial LNAs can be expected to tumble by perhaps 25-30% overnight.

At the same time developmental work on other aspects of the LNA front end also continue. At SPTS '80 in Miami DEXCEL is showing a new approach to the input probe; the probe in the new DEXCEL LNA is grounded and signal energy is transferred from the probe to the input stage via a coupling device. This 'air-gap' transfer should make the new DEXCEL LNAs almost impervious to lightning strikes (present or other probe structures are floated above ground). Anyone who has lost an LNA to lightning that often couples into the amplifier via the input probe can appreciate this added degree of protection offered by the new DEXCEL design.

THE WORLD ABOVE 10 GHz

by
Robert M. Richardson
Richcraft Engineering Ltd.
Drawer 1065
Chautauqua, N.Y. 14722
[716]753-2654

Summary

Last month's episode described how absurdly simple it is to create an fm/fm composite video-audio signal at 10 GHz using the Microwave Associates' Gunnplexer as the primary transmitter source with another Gunnplexer module as the primary receiver/down converter driving an ordinary wideband TV preamp feeding a **standard** am/fm television receiver **with no signal conditioning or modification whatsoever**. The secret to making this sytem work and deliver studio quality video and audio is to have the Gunnplexer i.f. output on one of the standard VHF TV video carrier frequencies, adjust video deviation to somewhat less than 4.5 MHz, and then slope detect the video signal with the TV receiver's i.f. amplifiers. Six different TV receivers were tested, all with superb results.

Correspondence

Dear Bob: I found the FM-TV part of your column very interesting in the December '79 issue of "Coop's Satellite Digest." I tried the experiment using an fm modulator module from an RCA broadcast video tape machine and hetrodyned the signal to the color TV i.f. frequency. You are right, it works very well and makes good color too. The color TV i.f. makes a very good slope detector for fm signals of about 2 MHz bandwidth. The i.f. bandpass is the typical "haystack" shape to achieve linear phase response. The slopes on each side are quite linear and either side will work equally well depending on the direction of the fm modulation. If you are on the wrong side the video will be negative.

Thanks for "discovering" the Richardson effect. It will sure make it easier to build some microwave TV links. See you on the Sunday 20 meter net at 14.311 MHz - 1300 CST.

Jim Keeth, AF9A
Indianapolis, Indiana 46260

Ed.: Many thanks for the kind words, Jim...and in color too!

FIGURE ONE

Gunnplexer [GPX] frequency stabilization and repeatability

There are fundamentally 5 parameters that affect GPX frequency stability and repeatability.

1) **Gunn diode bias** (bias means power supply of nominally +10 Vdc at 500 mA). Varying the bias is called "frequency pushing" and changes the output frequency on the order of 10 MHz per volt. Hence we use a stable & pure dc well regulated supply.
2) **GPX varactor voltage**, adjustable from +1 to +20 Vdc. This allows us to electronically "tune" the Gunn diode over a range of approximately 80 to 100 MHz.
3) **Mechanical rigidity** of the GPX module with respect to nearby reflecting objects, such as the parabolic reflector shown in Figure 1.
4) **Gunn diode & varactor diode aging**. This is insignificant and somewhat similar to crystal aging.
5) **Temperature stability of Gunn diode**, varactor diode, and their surrounding machined brass cavity. Typical frequency change per-degree-F variation of this cavity is approximately 150 kHz. This is not a whole bunch, but when one considers that 10 degrees F = 1.5 MHz, this would require that the TV set's fine tuning be re-adjusted which is an inconvenience and not acceptable to the average TV viewer. **Let's simply fix it.**

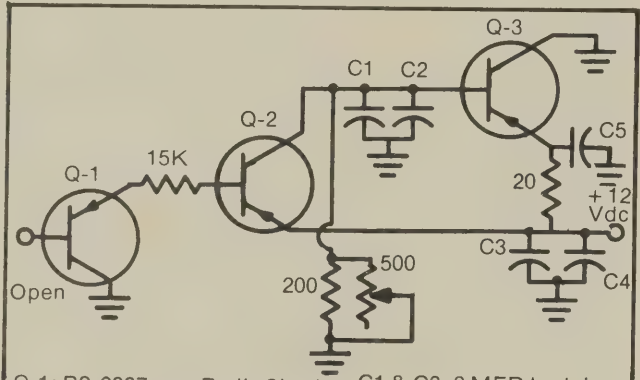
Assuming we have well regulated ripple-free dc power supplied to the Gunn diode and varactor diode, plus a reasonably rigid GPX module mount with respect to its parabolic reflector as illustrated in **figure 1**, the easiest way to achieve GPX frequency stability and repeatability is via proportional temperature control. This sounds horrendously difficult and complicated to most would be microwave buffs, when it actually it is one of the simplest and easiest tasks to build, test, and operate. Parts cost is less than $5.00, plus a 1 mA millameter, and if the following step-by-step instructions are followed, will give you **better than 1/100th degree F temperature stabilization**, and just as important, frequency repeatability (turn-off & turn-on).

4 GHz Howard/Coleman Terminal VTO

The exact same proportional temperature control (PTC) circuit may be used to temperature stabilize the Avantek 8360 VTO in your Howard/Coleman terminal, if desired. Let's continue while remembering the **dual** applications of PTC.

Proportional Temperature Control

Is nothing more than a simple **servo loop** consisting of an open-base Radio Shack #RS-2007 PNP germanium transistor acting as a temperature sensor, a small 1/4 watt 500 ohm potentiometer to adjust the temperature desired, and 2 Poly Paks 12 watt PNP transistors. The first Poly Paks transistor serves as a dc amplifier driving the second Poly Paks transistor which acts as the heating element. To operate properly, Q-2 and Q-3 should be of the same type. The schematic for this simple circuit is illustrated in **figure 2**.



Q-1: RS-2007 pnp Radio Shack
Q-2 & Q-3: Poly Paks 12 watt pnp #92CU3068 TO-220 case
C1 & C3: 8 MFD tantalum
C2: .001 ceramic
C4 & C5: .1 ceramic

- Figure 2 -

Transistor Q-1 functions as an excellent thermistor (a resistor whose resistance varies with temperature) over the range of 75 to 130 degrees F. It is epoxied to the side of the Gunn diode cavity "on-top-of" a thin sheet of tissue paper, as some of the RS-2007 transistors have the base lead internally grounded to the TO-5 case. **Figure 3** shows the GPX Gunn diode cavity, the rectangular protrusion, at the very top of the photo.

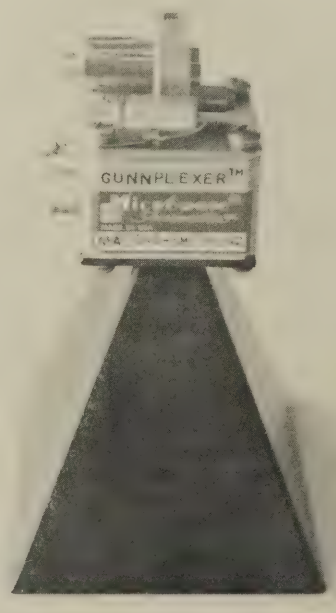
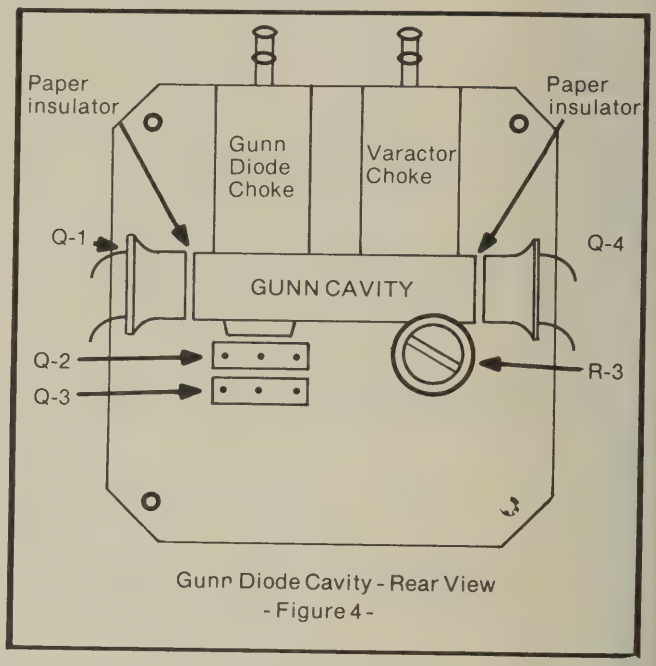


FIGURE THREE

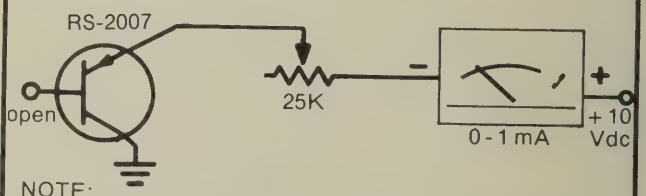
Both the Gunn diode and varactor diode (each only about 1/8" by 1/8" long), are in the center of the Gunn diode cavity shown in the rear end view in **figure 4.**



Gunn Diode Cavity - Rear View
- Figure 4 -

The two upper cylindrical tubes are 1/4 wave RF chokes for the Gunn and varactor diodes' dc feeds. The RS-2007 temperature sensing transistor is shown on the left of the Gunn diode cavity and another identical transistor is epoxied to the right side of the cavity. Why two sensor transistors? The second one is used as the sensor for our homebrew electronic thermometer which allows us to remotely monitor the temperature of the Gunn diode cavity. Electronic thermometer? Why complicate things? Not exactly; it requires only the RS-2007, a resistor, a 1 mA milliammeter and +10 Vdc regulated which we already have for the +10 Vdc at 500 mA Gunn diode supply. **Figure 5** illustrates this utterly simple but very accurate electronic thermometer circuit.

W4UCH Electronic Thermometer
- Figure 5 -



NOTE:
adjust 25K potentiometer so that mA reads almost full-scale at 120 degrees F and then substitute fixed value resistor

The remote electronic thermometer's 1 mA milliameter scale is calibrated using an ordinary glass thermometer and a glass of hot water. The TO-5 can of transistor Q-1 is "just" barely immersed in the hot water. As it cools, mark off the temperature scale as illustrated in **figure 6**. Two degree increments are adequate on a 5" meter face over the range of 90 to 120 degrees F.

Let's review figure 4 for a moment. The two protruding nibs on the bottom of the Gunn diode cavity are of interest to us. The one beneath the Gunn diode should be filed clean to bare brass and then lightly tinned with solder using a 50 watt

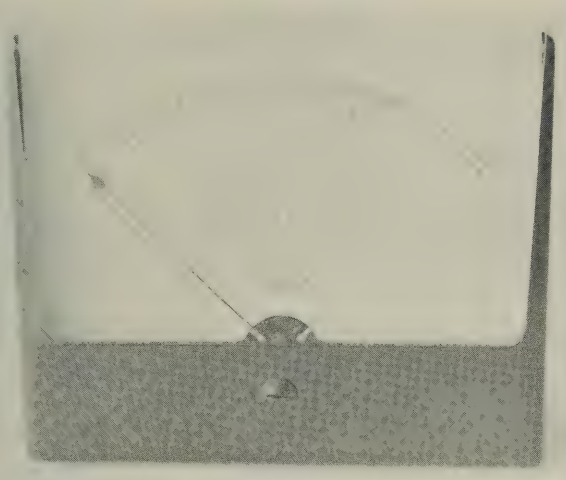


FIGURE SIX

Ungar soldering pencil. Also file and lightly tin the copper heat sink of transistor Q-3 on both sides. Now, quickly solder Q-3's heat sink to the nib beneath the Gunn diode on the bottom of the Gunn diode cavity. Q-3's emitter, base and collector leads should be facing **away** from the cavity housing. Bend Q-1's leads down 90 degrees, and solder appropriately to Q-2's leads that are bent **up** 90 degrees. Q-2 should be spaced about 1/8'' from and directly beneath Q-3. Only Q-2's leads support it. The 500 ohm mini-potentiometer, 1/4 to 1/2 watt, is supported by the soldered junction of Q-2's collector and Q-3's base on one side, and a stiff piece of #16 bus bar wire from the case to its center terminal. Though difficult to see at the top of Figure 7, the 500 ohm mini-pot faces straight **up**, so that a small screwdriver can be used to adjust it from the rear when fitted into the mylar covered balsa/plywood case.

Figure 2's ceramic disc and tantalum bypass capacitors are an absolute **must** to eliminate both very low and very high frequency parasitic oscillations. **Note:** The circuit will not operate without them. The wide-band TV preamplifier can be seen on the left side of the GPX module in **figure 7**. Figure 7's waterproof case, to the left of the GPX module, is also shown in figure 1 where it is supported on 3/8'' diameter hardwood dowels at the focal point 14-1/8'' spacing from the face of the GPX horn to the center of the dish), of the 25'' diameter aluminum Snowled parabolic dish ($8. from Sears Roebuck).

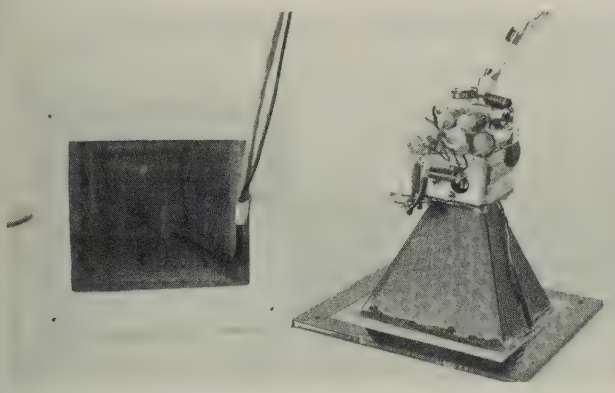


FIGURE SEVEN

How does it work

Quite simply, thank you. It is about as fundamental a feedback servo loop as may be constructed. The feedback is of course the heat transmitted from Q-3's heat sink through about 3/16'' of brass to the temperature sensor, Q-1. The concept for this design was described in the January '70 issue of **Ham Radio** magazine, pp 44-46, for a small crystal oven. If simplicity is the epitomy of good engineering, this has got to be a winner.

The base of Q-1, a germanium PNP transistor is left floating. Its collector current will increase about 10 times from 75 to 130 degrees F. As its collector current increases the forward bias to Q-2 and Q-3 decreases, thus reducing the amount of heat generated by Q-3. Depending on the setting of the 500 ohm potentiometer, and the heat overflow, a point of equilibrium will be reached where temperature stabilization will occur (as much as 1/100th degree F in a well insulated draft-free enclosure). We chose 120 degrees F as the optimum temperature for the Gunn diode cavity for a number of reasons. The nominal Gunn diode cavity temperature in the insulated enclosure runs about 110 degrees F at an outside free air temperature of 85 degrees F (we have about 1 or 2 days a year here at Chautauqua Lake, NY when it gets **that** hot). At 85 degrees F ambient, it only takes 10 mA of Q-3 heater current to hold the Gunn diode cavity at 120 degrees F. You **never** want to cut-off Q-3's current completely, or the circuit wil not PTC linearly, and that is what PTC is all about. At the other end of the temperature spectrum, say at a chilly +20 degrees F, it requires about 500 mA current through Q-3 to maintain the Gunn cavity at a constant 120 degrees F in the weatherproof enclosure. We have limited the maximum current through Q-3 to about 500 mA by including the 10 ohm resistance in its emitter lead (two 20 ohm 1/2 watt resistors in parallel) to give us both long life for Q-3 (a 12 watt pnp transistor) and to allow only a cheapy 1 amp 12 Vdc regulator to be used in its power supply.

FIGURE EIGHT

When it really gets chilly here at Chautauqua Lake, say from +20 F to -20 F for weeks/months on end, the styrofoam ''hat'' shown in **figure 8** may be used, or conversely, the 10 ohm resistor in Q-3's emitter may be eliminated if you wish to gamble with the life of these $.02 power transistors. The styrofoam ''hat'' may be built from 25 cents worth of 1'' thick styrofoam sheet available at most building supply or lumber yards. This particular ''hat'' was glued together (very carefully) with 5 minute epoxy. ''Carefully,'' because the epoxy ends to dissolve the styrofoam (we'll use resin next try!). At -20 degrees F, the PTC circuit draws approximately 900 mA with the 10 ohm resistor **out** of the circuit. **Note:** from stone cold **off** to fully temperature stabilized **on** averages 15 minutes, so allow this length time before operating. Even with the 10 ohm resistor **out** of the circuit, there is only 6 watts of heat available from the PTC and about 5 watts from the Gunn diode, which is somewhat less than a **high** power heating source at best.

Conclusion

The thermal conductivity of the GPX's small brass Gunn diode cavity is excellent. So much so, try this test to measure the time constant of the PTC system. With your PTC'ed GPX module (**out** of the enclosure) lying open on the workbench (pointed at a far wall to avoid damaging the mixer diode), and a 1 amp ammeter in series with the PTC +12 Vdc regulated

power supply, step back about 5 feet from the workbench and blow lightly at the GPX. Eureka. **It indeed does work**. About 1/2 second after you blew on it, the PTC ammeter will literally jump as from its idling level to about 100-200 mA higher current to compensate for the heat loss from your ''whoosh,'' and then slowly settle back to idle. **Now**, we understand why we shelter this 8 ounce bundle of aluminum and brass from drafts in its weatherproof enclosure for any serious long-term ''highly stable'' operation. If you choose to PTC the Coleman Terminal's Avantek 4 GHz VTO, we suggest you make a simple 1/4'' thick balsawood snug, tight, and draft-free enclosure for it. To waterproof it, simply iron on ''monocote'' mylar model airplane covering available from most all hobby shops.

''**The Gunnplexer Cookbook**,'' which will be available late spring 1980 from the Ham Radio Bookstore, Greenville NH 03048, has all the minute details for building this 10 GHz PTC system. What we have covered in this month's column should be adequate for the intrepid 4 GHz satellite enthusiast who wishes to PTC their Avantek VTO and/or GPX 10 GHz microwave TV relay or microwave TV distribution system.

Next Month

Will cover the construction and operation of a crystal controlled 4 GHz and 10 GHz weak signal source with its own antenna that may be built for less than $50. It will allow you to put your 4 GHz satellite receiver or 10 GHz GPX transmitters and receivers ''right-on'' the frequency desired and align their antennas to within a fraction of a degree.

RICHCRAFT ENGINEERING LTD.

...offers you a computer generated printed for antenna azimuth and elevation pointing from your receiving site to all major geostationary satellites capable of being received in North America. This provides you with a basis for locating the following satellites: SATCOM F1, F2, and, WESTAR I, II and III, and, COMSTAR I, II and III, and, ANIK III and B, and, Ghorizont, and, STATSIONAR 4. Provide them with your geographic coordinates (longitude and latitude to within 10 minutes, taken from Road Atlas if no other source is available) plus $5.00 to handle shipping and handling and write to Richcraft Engineering Ltd., Drawer 1065, Chautauqua, New York 14722 (716-753-2654).

TECHNICAL NEWS NOTES

Announcement at SPTS '80 Miami by **Ramsey Electronics** (P. O. Box 4072, Rochester, NY 14610; 716-271-6487) that it is now offering complete 'Washburn Receiver' (see this month's Technical Section **CSD**) kit for **$1495** is sure to bring out competitive spirit. Ramsey also offering complete set of **boards** for Washburn Receiver for **$99.95** and the full receiver wired and tested for **$2995**. Plus, anyone purchasing STT's 'Washburn TVRO Receiver Construction Manual' receives **10% discount** on any of above with special coupon found in manual. **Boards are ready for immediate delivery**; kits and wired and tested units are on a 6 to 8 week cycle.

WESTAR II (carries SIN, others) burped for over an hour December 11th causing mild panic at Western Union. Apparently this was first full-blown bird outage for II since satellite was launched in 1974.

ARIANE (European Space Agency) bird tests went perfectly Christmas eve and with the further set backs of U.S. Space Shuttle (now rated only 10% likely to fly by June tests, and 50% likely for September) COMSTAR has signed with Ariane to lift COMSTAR IV (replacement for I) in early spring of 1983. Launch on December 24th was carried live in France via Symphonie satellite relay. Indian Apple will launch on Ariane in June with single 4.1 GHz downlink transponder to 'test direct to home telecasting'; will locate 102 degrees east.

Japanese plan launch this month of ECS-B, test satellite operating 32/35 GHz, with single transponder; expected life is one year.

Hughes Aircraft is forming new division to launch a pair of C band (6 up, 4 down) domestic satellites; hopefully as early as first half of 1982. Birds will be 24 channels, provide 34 dBw EIRP over continental U.S. (CONUS), Puerto Rico and Virgin Islands (and one assumes most of Caribbean) from eastern orbit slots of 79 and 75 degrees west. Spacecraft planned will be similar to ANIK-C (which Hughes built) with extra fuel and spare transponders (ala SATCOM FIII). Without major rejuggling, this leaves one orbit spot at 71 degrees unspoken for plus possible slot at 140 degrees. Projected 79 and 75 degree spots too far east to cover Hawaii or Alaska.

Hardware for proposed marriage of COMSAT and Sears (see **Coops Comment on Programming** this issue **CSD**) is expected to cost $300 per terminal with $15 to $20 range monthly fees. COMSAT also reportedly talking with Tandy Corporation (Radio Shack) and several direct Japanese suppliers about home terminals.

FCC hearings regarding state of COMSTAR turned up that COMSTAR 1 (at least) has power supply problems and FCC apparently 'faulted' ATT for designing birds with footprints that preclude use of **all** transponders for **all** of U.S. locations (see **CSD** December 1979 for COMSTAR footprints). COMSTAR attempting to justify construction of additional satellites.

NASA will launch only three communication satellites this year; INTELSAT V-A in February and V-B in May and V-C in August. All are dual band (first INTELSAT use of 12/14 GHz region). Each outfitted with 15 transponders at C band (7 with 36 MHz bandwidth, 8 with 72 MHz bandwidth) and 3 in higher band (2 with 72 MHz bandwidth, 1 with 240 MHz bandwidth).

One approach to shrinking EIRP problems proposed by Hughes commercial antenna offered to cable industry at December Anaheim show; an 'expansion ring' that adds 1 meter size to existing 5 meter antenna (clamps around outside of antenna). Extra one meter at this size adds 1.5 dB gain with price tag of $3,000 when 'added on' to existing order for basic five meter antenna.

Additional problems with transponder 6 on ANIK-III are making Canadian Telesat people nervous. ANIK-III recently began televising House of Commons debates on transponders 4 (French) and 11 (English) for Canadian cable systems.

CORRECTION - HOWARD TERMINAL UPDATE

Readers working on the Taylor Howard 24 channel tuneable receiver who were pleased to have the updated modifications to the demodulator and video output stages (see page T13 for December 1979) should make the following corrections on their schematics:

1) In the 30 Hz clamp/video amplifier stages on the right hand side of the schematic appearing page T13 for December you will find a pair of 1 MFD / 20 volt capacitors between the first 2N2222 and the second 2N2222 stages. The second (right hand) 1/20 should be eliminated and replaced with a direct connection from the first 1/20 (where juncturing with the HP5082/2800 diode) to the base of the second (most right hand) 2N2222. Failure to do this (i.e. leaving **both** 1/20s in place) will do nasty things to the bias on the 2N2222.
2) In the same general area of the schematic there appears (right and below the capacitor in question) a 1N5248 12 volt zener. The zener required here should indeed be 12 volts but a 1N5248 is not a 12 volt zener. Cross out 1N5248.

COOP'S COMMENT ON PROGRAMMING

SATELLITES AND HYPE

Now that the mass media is discovering satellite technology (witness the **NBC Prime Time Sunday** report December 23rd or the **CBS Morning News** report early in January) it has become fashionable for those who somehow conceive that their corporations may have some piece of this action to begin touting satellites in the public forum.

This month's gathering at SPTS '80 in Miami certainly points up that we are at a jumping off place for equipment. At SPTS '79 in Oklahoma in August the hardware on display was from either the cable industry stockpiles or from a handful of far-sighted (but small) firms that had decided to gamble that satellite TV was here to stay. There **are** a number of significant new pieces of hardware on display in Miami this month **but** the real significance is not the hardware on display but the people in attendance. SPTS name badges don't identify the individual's business affiliation and that is probably a good thing. But our registration rosters do and when we see dozens of engineers and marketing types from major electronic manufacturing names world-wide on the roster we know that satellite TV is about to take a big step into the corporate big time.

Most of the heavy corporate activity seems to be keyed to the COMSAT announcement that they expect to launch a satellite (**they say** as early as 1983 but **we** all **know** that is more apt to be 1987 or after) to bring six channels of television to anyone that wants to pay for it. COMSAT has got to **convince** Congress and the FCC that what they propose is worth doing, that **they** are the people to do it, and that they should be allowed to do it **like** they want to do it. The fact that they have yet to detail their plan or obtain any permission from **any** of the necessary authorities to do what they say they will do has not stopped them from hyping the proposed program as if it were an accomplished fact. A prime example of hype was the business announcement early in January that COMSAT would be marketing their 12 GHz antenna-receiver-decoder systems through Sears-Roebuck. That announcement certainly could not be expected to hurt the market value of Sears stock and publically owned COMSAT got a lot of free mileage out of it as well.

The fires of public interest are being constantly fueled now by talented writers such as Neil Hickey who penned in the January 5th edition of **TV GUIDE** what he envisions television to be like during the 80's. About satellites Hickey notes "...the **potential of the satellite is so great that it will change the entire fabric of society...**" and he suggested the afore-mentioned COMSAT system (may become) "**a system of transmission that might...one day obviate all others**". Humm. If satellites are generally perceived to have such impact, it is no small wonder that Sears-Roebuck and others are cranking out press releases that tell the world **they too** will be a part of this new form of television.

The danger inherent with all of the Neil Hickey type articles or the Prime Time Sunday television reports is that (1)they **look for** sensational headline grabbing quotes or comments or revelations, and, (2)they **overlook** most (if not all) of the engineering, political and economic realities of the already in place satellite system. There is no question that 12 GHz satellite service will one day come to the United States (Canada already has it through the experimental channels now operating on ANIK B) Sears' announcement makes it seem like it is here now, today. That by next Christmas or the Christmas thereafter stores from coast to coast will be flooded with home satellite terminals. We didn't check Sears stock quotations the day of (and after) the COMSAT announcement but we would be surprised if it didn't go up.

There will be plenty more of this 'hype' in the months and years to come. As an insider in the satellite business you will be called upon to give your own views to either interested people or the local press. We caution you to stick to the realities of today as you feed these journalists and broadcasters who are by nature looking for something truly sensational to share with their readers or viewers. The satellite revolution in its real format is exciting enough without unnecessarily hyping it into a Buck Rogers 25th century scheme. No good is served by getting the hopes and expectations of the general public up prior to the time we as an industry can deliver. And we sure aren't there yet!

WE'LL MISS OLIVER

Oliver Swan died on Christmas eve. His death came after a short but painful illness that became apparent last October. As a separate report here notes his family will carry on production of the Swan Spherical Antenna and plans are still on stream for large scale production of the antennas by Gardiner Communications Corporation.

No-one can or ever will replace the creativity of Oliver. A special videotape commemorating some of his accomplishments is being shown during SPTS '80. Oliver was truly a legend in his time and the legend will go on forever.

WARC 79

CSD's report on WARC 79 is being held back until the Department of State has completed its own thorough analysis of the event. We anticipate having it in print in either the April or May issue of CSD.

COOP'S SATELLITE DIGEST (Programming Edition) is produced monthly by Satellite Television Technology, P.O. Box G, Arcadia, Oklahoma 73007 (405-396-2574). CSD is available in two separate editions (Programming and Technology) or as a combined subscription. Subscription rates are $30 per year for first class mail delivery within U.S.A. or Canada for either edition, or $50 per year for the combined editions. Outside U.S.A. or Canada add $25.00 per year for any subscription. All subscriptions to be paid in advance in U.S. funds drawn on a U.S. bank; no invoicing.
Contents are Copyright 1980 © by Statellite Television Technolgy and any duplication or reproduction in any form without written permission is a violation of Federal Statue (17 USC 101 et seq.).

THE FIII

DISASTER

RCA FIII GONE???

As reported briefly in last month's **CSD** RCA lost SATCOM FIII and apparently the mystery of what actually happened to the new 'cable television satellite' will not be answered soon; if indeed ever.

RCA's FIII managed a proper lift off from the Cape on schedule on December 6th after a successful launch atop a Delta 3914 launcher. However early on the morning of December 10th, when the satellite was in the process of being transfered from its inclined or elliptical transfer orbit to a 'drift orbit' that would have approximated the final geostationary circular orbit all telemetering signals from the bird were lost. The transfer from an elliptical transfer orbit to the drift orbit is handled by firing of a small rocket called an 'apogee kick motor'. Approximately 15 seconds after the firing of the apogee kick motor all communications disappeared.

In the for-what-its-worth department a similar event occured in July of 1970 when an Intelsat bird (3F8) also aboard a Delta launch vehicle at lift off also disappeared forever 15 seconds after the apogee kick motor was fired. **The 3F8 bird was never heard from again.** Earlier, another Intelsat bird (2F1) blew a cowling when an apogee kick motor also failed although this bird was partially recovered after the incident.

Theories are a dime a dozen as to what happened to the satellite. They run the gamut from an explosion of the satellite itself set off by the firing of the apogee kick motor to an improper 'burn' of the kick motor sending the bird into some unknown orbit that apparently cannot be traced. Alternate theories have the satellite in a drift orbit (assuming in this case the apogee kick motor did what it was supposed to do) but electrically inoperative due to a massive failure of the powering system on board.

Immediately following the incident, which occurred while the RCA Astro-Space Division was still 'flying' the satellite and prior to it being turned over to RCA Americom for operation, RCA contacted NASA, NORAD and other agencies both public and private to seek assistance in tracking of the satellite. Apparently all such efforts failed to produce any indication that FIII (or parts thereto) was anywhere to be found. NORAD was conducting the most diligent search utilizing a computer enhanced sector by sector radar profile which systematically searched the most likely areas in space where the satellite might have gone to or where pieces might be expected to be found if indeed it did blow up.

RCA carried massive insurance on the launch (approximately $70 million worth) with a premium of near $7,000,000 with a number of insurance carriers. Cable industry leader Ed Taylor of Southern Satellite Systems noted "**the insurance premium pretty much tells the story; this was nearly the tenth domestic bird to be launched** (WESTAR has three, COMSTAR three and this was to have been RCA's third) **and the premium was just about 1/10th of the insured amount. The insurance carriers apparently figured the risk was in the 1 in 10 ballpark...**".

As reported on the January 3rd and 10th edition of **Satellite Magazine** (see transponder 21 at 12 noon eastern each Thursday) the primary concern with the cable industry seemed to be whether some of the new (for cable television) services scheduled to begin operation after the successful launch and positioning of FIII could indeed be accommodated on the birds presently in orbit. FIII, to be have positioned at 132 degrees west, was to have been a brand-new totally-for-cable-TV satellite with 24 transponders dedicated to that purpose. Virtually all of the present cable TV services operating through F1 were to have moved to FIII and they would have been joined by approximately four additional (not presently operating) services to fill out the 24 transponders. At that point RCA was going to make 11 of the presently operational 22 transponders on F1 (4 is broken totally and 14 is not fit for full time, full pwoer service) available for what RCA was at the time of launch calling "The Second Cable TV Network". RCA reportedly had several of these 11 transponders pre-leased to would-be-programmers to the cable TV industry.

With the loss of FIII where does the cable industry find itself today?At least two **new** fulltime programmers **will be able to be accomodated** on F1.Transponders 15 and 19 have never been assigned (by RCA) to television programming. One has been in east-west while the other has been in west to east SCPC service. This audio-only pair of transponders has been in keeping with an informal RCA policy that until now each of their satellites will have the capacity to do both television **and** SCPC work when called upon. RCA will vacate 15 and 19 by moving this SCPC service elsewhere (SATCOM FII is a likely spot). That's two of the four additional spots which cable was to have gotten **on FIII**. Transponder 14 on FI was originally assigned to Trinity's KTBN but a problem developed with it and Trinity was switched to 13. Transponder 14 is not gone, but it has stability problems which make it unsuitable for full-time video service (at one time the story was that with prolonged use the transponder may drop from the nominal 5 watt power output to something closer to (or below) 1 watt; a more than 6 dB drop in EIRP which CATV type receiving antennas could not tolerate.)

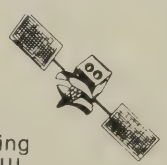
Just after the launch itself (but prior to the loss of FIII) these were the four additional users who were expected to appear on the four newly available transponders on FIII:

1)**National Christian Network** (a 24 hour per day new religious transponder)
2)**Cable News Network** (Ted Turner's new service slated for a summer 1980 start)
3)**HBO** (their fifth transponder)
4)**Showtime** (their fourth; they presently have 10, 12 and 17 but sublet 17 to Eastern Microwave for transmission of New York City's WOR).

HBO already utilizes 22 and 24 for their west and east coast feeds. They also utilize 23 for their 'mini-pay' service TAKE-2. Their transponder 20 is a reserve or backup and many firms use it on a per program feed basis on a sublet basis. HBO is said to be working on at least two new services which they apparently intended to 'launch' with the cutover to FIII. One of these was to have been a **24 hour-per-day** premium service channel. HBO, affiliated in a corporate way with Time-Life, is

MAKE INTELLIGENT PROGRAMMING DECISIONS...

...with **SAT-Guide**



Twenty channels of programming today on FI, soon 35 on FI and FIII. Keeping up with what is 'up', when, is almost impossible. Until SAT-Guide.

ALL FI programs on **all** transponders are listed in this unique programming guide to satellites. INCLUDES daily program listings PLUS monthly summaries of movies, sports and specials. Only $28 per year from:

SAT-Guide P. O. Box 1569
Division of Commtek Hailey, ID 83333

also scheduled to begin feeding 6 hours per day of English (**BBC** and **ITV**) programming to cable system clients around April 1st and even with the loss of FIII we understand that this 'English TV' feed **will** most likely still go ahead **on reserved transponder 20**.

Showtime has said less (if anything) about their plans for a fourth transponder. It has been assumed by cable industry insiders that Showtime **did not have** an immediate plan for it however; they were probably planning to sublet it as they now do 17 until their own plans for regular use jell.

If HBO can get along with their present four and Showtime is not that anxious to use a fourth of their own, that leaves us then with Ted Turner's Cable News Network and the new National Christian Network to place on the to-be-available transponders 15 and 19. Seemingly there is a fit (two for two).

There are other elements involved however. Eastern Microwave (WOR) is not happy with their present sublet status on 17 fearful that they could be forced to vacate 17 on short notice if Showtime decided they needed 17. Others who have something called **preemptible service** (the lowest class of transponder service available) and who had planned to 'upgrade' their status with the move to FIII are for the time being stuck in a posture of being the first to go (at RCA's descretion) if a transponder fails for some RCA customer with a higher grade of service (transponders 3,7,9 and 21 are considered the most risk prone for preemption on F1). Naturally the firms presently occupying these four transponders are nervous since they could be bumped at anytime (as all four were last September when FII had a bad day in the sky and RCA had to temporarily shift all Alaskan traffic back to F1).

RCA has the cable industry where it wants it; on an RCA bird(s). The cable industry had talked itself into having to have two satellites (FIII as the primary an FI as the 'second network') so the cable industry seemingly is now ready to spend money for a second satellite antenna. RCA would like to create a way for cable's 'second network' to be on SATCOM FII if it can. Unfortunately FII is a less than ideal bird for this purpose.

Cable started on FII and moved to FI back in June of 1978. FII had excellent service and coverage and many of the original cable systems utilizing satellite still maintain that FII service was superior in most respects to FI (particularly in the east and southeast since FII sits at 119 degrees west which produces a far better 'look angle' for areas like Florida and New England). In spite of these good vibes from old timers in cable-satellite, FII has problems:

1)One transponder set (3, 7, 11, 15, 19, 23) is a special 'Alaskan beam' which has EIRPs in the 29 dBw region no further east than the Chicago-New Orleans line with levels in the 26 dBw region along the east coast. This transponder set could not be used for a nationwide service.

2)At least two other transponders (not in the above set) are ill or not functioning at all.

For cable's nationwide purposes, this converts the 24 channel new-bird capacity to at best 16 transponders.

3)RCA has one complete set (of two) east-west and west-east SCPC/FDM transponders on FII and if the 15/19 set on FI is moved to FII that totals four more transponders not available for cable's use.

And 16 transponders has now become 12 potential transponders.

4) NBC has also a contract with parent RCA for use of transponder 8 (or some other as selected) for backfeeding TV program material from Hollywood to New York on a regular (as in almost routine) basis.

12 now becomes 11.

5)RCA has an undetermined number of additional business customers utilizing a variety of formats (including video) which they must be prepared to service when called upon (Robert Wold for example).

Only RCA knows who these firms are or what their requirements are but we must assume that 11 is not 11 at all but some lesser number.

6)RCA, to remain competitive with WESTAR and COMSTAR for 'occasional use' customers who require transponder space in a hurry to televise news, sporting and other events must have some spare capacity. The long haul in the satellite business will require that **any** satellite owner be prepared to give space as able when required and RCA does not want to lose this ability and therefore pass the ball to WESTAR and COMSTAR without a contest.

So the 'strain' on RCA SATCOM FII is considerable. One possibility kicked about calls for RCA to go to WESTAR or COMSTAR to lease from them transponder space for some of the RCA customers (such as the NBC transponder, or the SCPC/FDM transponders). To do this RCA would, among other things, have to retrofit their own TTC uplink and straight uplink stations with an additional antenna so that RCA 'ground' customers could be linked from RCA ground to RCA ground via a leased WESTAR or COMSTAR transponder. One also must consider carefully the footprints of COMSTAR (see **CSD** for December), which are at best strange since each set of four antennas (six transponders per antenna) has a distinct pattern all of its own and none of the COMSTAR antenna sets provides anything approaching Hawaii to Maine plus Alaska to Puerto Rico coverage. WESTAR has a broader antenna beam but fewer transponders available (12 versus 24).

RCA has a backup agreement with the Canadian Telesat (ANIK) family wherein in the event of a massive failure of a SATCOM bird RCA can lease on an emergency basis 11 of the 12 transponders on an ANIK bird. Unfortunately ANIK I and II are at best ill and they can largely be discounted from serious use by anyone. ANIK III reportedly has an erratic transponder 6 and possibly another on the fritz. And since Canada's Telesat signed that agreement with RCA ANIK III has become an important bird for the Canadian cable industry and others (transponders 4 and 11 are currently feeding Canada's House of Parliament to Canadian cable systems so equipped). The new ANIK B, one year in service this month, is a dual-band bird with capacity for both 4 GHz downlinks and 11/12 GHz downlinks (12 transponders on 4, and 4 transponders on 12). However the operational power capabilities of ANIK-B are such that only 12 of the 16 transponders can be 'fired' at once (in whatever combination Telesat wishes). At the present time two of the ANIK-B 12 GHz transponders are in daily use for the CBC English language feed and the new feed of Vancouver CHAN-TV as an 'independent' CTV network feed. Canada has hundreds of millions of dollars riding on the successful demonstration of the new ANIK-B 12 GHz service since they see this demonstration as being key to developing Canada as a technology source for 12 GHz satellites and 12 GHz receiving systems for worldwide marketing. You don't mess lightly with the 'Crown Jewels'!

Thus we have a ripple or domino effect at play here. The seeming 'great capacity in the sky' is not so great after all. WESTAR is a victim of its present success in selling services to regular customers plus its 12 channel capacity. COMSTAR is a victim of its strange (by design) footprints (plus there are persistent rumors that COMSTAR 1 at 128 degrees has power

FOR YOUR EARTH STATION, CHOOSE

AVCOM'S PSR-3

SATELLITE VIDEO RECEIVER

DESIGNED FOR YOUR PRIVATE TERMINAL

- Remote tuning
- Dual video outputs
- Exclusive Clamp-Sync & Scan-Tune
- Many other features!

AVCOM of Virginia, Inc.
10139 Apache Road, Richmond, VA 23235
(804)320-4439

supply problems). ANIK has four birds up but the oldest two are largely occupying space in space and the remaining two have other special constraints; and no ANIK has suitable U.S.A. coverage. RCA has a full F1 (with two transponders missing) and a confused FII loading posture.

On top of all of this FII is maintained on a day to day basis through the sheer guts and determination of a handful of dedicated RCA flight controllers and engineers. FII has a mal-functioning solar panel rotational system; once each day the automatic tracking of the solar array is shut off and the array is manually (i.e. by control from ground) spun backwards some 330 degrees so that a 'cable' that apparently broke loose during the initial launch doesn't snare the giant solar panel and hang it up. FII has had some attitude problems; last September the bird 'went berserk' and for one long day RCA seriously wondered whether they could bring it back under control.

So if RCA does move transponders about and create room on SATCOM FII for a 'second cable network' on an interim basis, there will remain the distinct possibility that FII may give superb service only until the time the bird decides to act up. And that (based upon actions of the past) could happen at anytime.

What about FIV? Normally there is an on-ground spare. RCA FIII **was** the spare for SATCOM. RCA has to obtain FCC permission before it can start construction of an on-ground spare (the tariff which RCA charges is based upon its investment in satellite hardware and services and the construction of an on-ground spare therefore becomes part of the tariff base) and it did so only last fall. The best estimates, by RCA, of when SATCOM IV will be ready to fly is in the spring of 1981. The earliest launch date is therefore in the April -July span of 1981. And in the interim, if F1 or FII burp and fail? There will be no replacement available. (In a catastrophic failure situation, where there **is** an on-ground spare ready to go, the best estimates are that it would take no less than 90 and perhaps 180 days to get a replacement into position.)

Viewed as a 'whole-situation' rather than a bird by bird set of isolated parts, the tenuous nature of the present North American DOMSAT satellites is more evident. No **single** disaster is likely to wipe out **all** of the capacity in the sky, but if any part of what is now in place should fail, there are bound to be ripples of repercussions felt all up and down the line. Even in space, nobody stands alone.

WTBS PROGRAM SCHEDULE/OPERATION

WTBS GROWTH

Just over three years ago Atlanta's WTCG became the first United States broadcast television station to begin regular distribution via satellite. Within hours of an FCC ruling that WTCG (now WTBS) could be relayed from the Atlanta market area to distant cable systems via microwave Southern Satellite Systems (the common carrier authorized to carry WTBS via satellite) had the signal on the bird on transponder 6 and within a couple of weeks several thousand U.S. homes, far from the Atlanta market, were able to tune in Ted Turner's "Super Station" (although that nick name would come many months later). Late this past November WTBS passed the 5.5 million home mark via cable served homes and there continues to be no let up in the progress the station is making. (By comparison New York City's WOR, **before** it also became a satellite relayed service, was averaging **weekly viewing** in the under four million home statistic area.) The WTBS audience reach is huge, from Hawaii on the west to the Virgin Islands on the east, Alaska and (illegal terminal served) Faro, Yukon on the north to deep into the Caribbean and Mexico on the south.

The WTBS schedule (see current week's guide here) is innovative and far more intriguing than most indie stations in the United States. Ted Turner went into the satellite relay business with a film library of more than 3,000 films and a good hold on most of the popular (if older) syndicated shows. Turner had negotiated his film library and syndication purchases far in advance and many now feel he did so prior to going on the satellite so as to be able to 'coast' for several years without worrying about the impact his satellite distribution might ultimately have on the rates his station pays for programming.

WTBS, unlike all of the other indies available via satellite, has worked hard to help the cable systems promote the service. Turner's people help cable affiliates with advertising materials, even co-op advertising dollars, to see that when a town "turn's on WTBS" that everyone in the area is aware of the new service. WTBS maintains a highly skilled promotional department that sees to it that newspapers, magazines and other outlets where people turn for TV program information have ready access to not only the weekly schedules but a wide range of support materials listing the station's heavy sports and specials schedules.

WTBS is so well known that the station now regularily receives mail from people who learn about satellite TV.Typical letters ask WTBS for information on where the writer can learn more about the equipment required to receive WTBS **directly via satellite**! (Station personnel routinely answer such letters with a form letter that sends the enthusiasts to CSD we might add.)

Ted Turner has hitched his resources to the cable/satellite 'star' and his innovation and daring have only begun. Scheduled for a mid-1980 start, likely based on Satcom I Turner's Cable News Network (CNN) which when operational will bring into the cable (and direct view satellite homes)a full twenty four hour per day news channel service with live anchor people, extensive live and tape delayed reports fed to CNN via satellite from news making sources around the globe, and an extensive schedule of in-depth interviews and looks behind the headlines of the day. Turner has funded CNN (for which a new building is now being renovated in Atlanta) by digging deep into his own pocket and selling off such assets as a North Carolina UHF station which he previously owned. Turner feels that launching CNN may take upwards of $40,000,000 and there will be a $2,000,000 per month overhead to meet while the service operates at a loss and becomes established. Cable systems taking the CNN service will be paying a flat fee (around $.15 per home per month) in the early days and as advertising support for the unique 'live-24 hour-news-service' picks up the cable rate per home per month will gradually go down so that eventually the service will not cost the cable operator anything to have on his system. Turner is hoping to have more than two million U.S. cable homes ready to plug into when the service kicks off next June, and is shotting for 7 million plus homes as quickly as possible to 'cover the operating nut'.

Most of the key CNN staff people are already on the job working out the logistical details of the new service. Turner intends that his CNN service will take every advantage of the technology that the satellite age has to offer and in this respect his 24 hour per day service will be extremely unique. Not 'boxed in' to 30 minute or even 60 minute time limits, such as the network newscasts are, Turner intends that by marrying live satellite relayed news reports to an open-ended format his CNN service will stand out for its immediacy and attention to detail. For any died in the wool news buff, this June can't come fast enough!

WTBS 17 ATLANTA

*Formerly WTCG

PROGRAM SCHEDULE

THE 24-HOUR TV STATION WITH 40 MOVIE SHOWINGS A WEEK

1018 West Peachtree Street, N.W., Atlanta, Georgia 30357 (404) 875-7317

CENTRAL STANDARD TIME

Schedule Eff. 9/24/79

TIME	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY	TIME
5:00	Listen	World At Large				Human Dimension	Between the Lines	5:10
5:30	The Athletes					It's Your Business		5:30
6:00	News							6:00
6:30	Three Stooges & Little Rascals				(6:00 M-F) N* (6:30 M-F) N* (7:00 M-F) N*	3 Stooges Little Rascals	Jimmy Swaggart	6:30
7:00	Leave It To Beaver				(7:30 M-F) N*	Ultra Man	Dr. E.J. Daniels	7:00
7:30	Romper Room					The Partridge Family	3 Stooges & Friends N*	7:30
8:00	The Lucy Show					Maverick	N*	8:00
8:30	Green Acres						Lost in Space N*	8:30
9:00	Movie 17					Hollywood Classics N*	N*	9:00
9:30							Hazel N*	9:30
10:00							Academy Award Theatre N*	10:00
10:30							N*	10:30
11:00	News 11:55						N*	11:00
11:30	Love American Style					Movie 17 N*	N*	11:30
12:00	Movie 17					N*	Movie 17 N*	12:00
12:30						N*	N*	12:30
1:00						N*	N*	1:00
1:30	News 2:25					N*	N*	1:30
2:00	The Gigglesnort Hotel					N*	N*	2:00
2:30	I Love Lucy				(2:00 M-F) N*	Movie 17 N*	Movie 17 N*	2:30
3:00	Flintstones				(2:30 M-F) N*	N*	N*	3:00
3:30	Spectreman				(3:00 M-F) N*	N*	N*	3:30
4:00	Gilligan's Island				(3:30 M-F) N*	Movie 17 N*	Movie 17 N*	4:00
4:30	My Three Sons				(4:00 M-F) N*	N*	N*	4:30
5:00	I Dream of Jeannie				(4:30 M-F) N*	N*	N*	5:00
5:30	Carol Burnett				(5:00 M-F) N*	Championship Sports	Best of Championship Sports	5:30
6:00	Bob Newhart				(5:30 M-F) N*		Nashville on the Road	6:00
6:30	Sanford & Son				(6:00 M-F) N*		Porter Wagoner	6:30
7:00	All In the Family				(6:30 M-F) N*			7:00
7:30	Falcon Football	Movie 17			(7:00 M-F) N*	Pop! Goes the Country	Movie 17 N*	7:30
8:00					(7:30 M-F) N*	Good Ol' Nashville Music	N*	8:00
8:30	Movie 17				(8:00 M-F) N*	N*	N*	8:30
9:00	(9:00 M-F) N*	Six Wives of Henry VIII / Elizabeth R	Upstairs/ Downstairs	Civilisation	Valiant Years	Movie 17 N*	N*	9:00
9:30	(9:30 M-F) N*				Up Close	N*	Comeback N*	9:30
10:00	(10:00 M-F) N*					N*	Ruff House	10:00
10:30	Last/Wild	Last of the Wild N*						10:30
11:00	Movie 17					Rock Concert	Open Up	11:00
11:30								11:30
12:00						Juke Box		12:00
12:30	17 News Early In the Morning					Movie 17	Movie 17	12:30
1:00	Movie 17							1:00
1:30								1:30
2:00						Movie 17	Movie 17	2:00
2:30								2:30
3:00	Movie 17							3:00
3:30								3:30
4:00								4:00
4:30								4:30
4:40						Agriculture USA		4:40

N*: 30 News Update

What does the future hold for the one **true** 'Super Station' on satellite; WTBS? Turner's personnel are beginning to see indications that while WTBS cable-reach growth continues healthy, saturation may be on the horizon. The FCC has rules on the books which limit the number of non-network (independent) stations a cable system can carry (in many area) and for many cable systems in the northeast and around Chicago, that 'quota' was reached **before** WTBS became available, or so popular. There is a general feeling at WTBS that perhaps when Warner Cable does drop KTVU from satellite carriage sometime early this year that the three remaining indies on satellite may remain the only indie signals available for quite sometime; at least until the FCC re-addresses the indie-quota-system or until the natural development of WTBS programming makes it look less and less like an indie and more and more like a network unto itself. There is a popular theory around that making WTBS **look so much different** than other indies that it can stand alone is exactly where Turner is headed with the station. While Turner continues to lean on movies and sports for much of his programming appeal, there are indications that he is seeking to fill the balance of the programming day with material which simply is not found on other indie stations. If he can do this, successfully, he will then be able to proclaim that WTBS offers viewers a real alternate viewing choice not available on any other station in the United States and via the backdoor he just may become a network of his own in his own right.

WTBS 1980 SEC AND ACC TELECASTS

An extensive schedule of Southeastern Conference and Atlantic Coastal Conference college basketball games is scheduled through the winter on transponder 6's WTBS.

Date	Day	Eastern Time	Team
2-06	Wed.	9:00PM	Vanderbilt / Auburn
2-09	Sat.	TBA	SEC wildcard game
2-11	Mon.	9:00PM	Alabama / Georgia
2-11	Mon.	11:00PM	Wake Forest / NC State (del.)
2-16	Sat.	7:00PM	Virginia / NC
2-20	Wed.	9:00PM	NC / NC State (delayed)
2-21	Thur.	9:00PM	Georgia / Tenn.

RUSSIA'S U.S. VIEWABLE BIRDS

by
Steve J. Birkill
128 Cross House Rd.
Grenoside
Sheffield, S30 3RX
England

Soviet Geostationary Satellites: An update

Since my last contribution appeared in CSD, I have gathered more detailed information on the current state of these satellites. **Table One** is from a reliable source, and indicates the situation as it stood in November/December 1979. There are a couple of points of interest here - of special interest to North American readers. First, I was mistaken about the identity of Statsionar 4. It is now revealed as one of the new high-capacity **Ghorizont** (Horizon) satellites, its multiple TV channel capability and spot beams making it a considerable advance on the earlier Raduga birds, which seem to be similar to Molniya 3 type, though no detailed information is available.

The 14° West position of this bird makes it visible to the eastern United States, in fact, as Coop pointed out in the November '79 **CSD**, if you are east of the north-south line joining Chicago and New Orleans it will be above your horizon. And with **up to five channels of TV** it's worth looking for. Programs are for the most part in Russian, and include movies, opera, concert, childrens, and much emphasis on news and sport. I haven't seen any baseball yet, but soccer and ice hockey are common, plus athletics when in season. The Moscow Olympic Games will occupy much transponder time this coming summer. Frequencies and transmission standards? See below.

The second interesting fact evident from table one is the location of **Raduga 4**. Only launched in 1978, we would expect it to be fully operational. Yet it is reported as being maintained at **87°W**, not only a **non**-Statsionar location but in fact a slot allocated to, and occupied by, **Comstar 3!** Why? I'm open to suggestions. If the published data is correct, the satellite is **not in view from any part of the Soviet Union**. The maintenance of that longitude within a fraction of a degree over several months, and not being one of the gravitational equilibrium points, **demands control**. Perhaps the spacecraft is under command from a **Soviet ship**, or from some territory in view of 87°W (i.e. Cuba??). If it were to transmit on its TV channel of 3895 MHz, it would interfere with Comstar 3's channel 10, and would surely suffer intereference on its 6 GHz uplink. Perhaps we should keep a check on that channel!

How to Find Molniya Satellites

In December **CSD** I described the orbit used by the Russians for their Molniya satellites in the Orbita system. Recent Molniya launches have averaged an **inclination of 62.82 degrees**, apogee of **39825 km** and perigee **580 km**. As the orbit ages, perigee falls steadily to **100 km** before decay occurs, after

NAME OF BIRD	LAUNCH DESIGNATION	STATUS OPERATIONAL?	LOCATION
Cosmos 637	1974- 17A	**dead**	drifting
Molniya 38(S1)	1974- 60A	**dead**	drifting
Cosmos 775	1975- 97A	**dead**	drifting
Raduga 1	1975-123A	**dead**	80°E ?
Raduga 2	1976- 92A	Statsionar 3 **spare?**	85.41°E
Ekran 1	1976-107A	ex Statsionar-T, **dead?**	53.46°E
Raduga 3	1977- 71A	Statsionar 2, operational	35.32°E
Ekran 2	1977- 92A	ex Statsionar-T, **dead**	drifting
Raduga 4	1978- **73A**	**spare**	**86.97°W**
Ghorizont 1	1978-118A	Statsionar 5, operational	55.36°E (inclination 11°)
Ekran 3	1979- 15A	Statsionar-T, operational	98.19°E
Raduga 5	1979- 35A	Statsionar 3, operational	84.22°E
Ghorizont 2	1979- **62A**	**Statsionar 4, operational**	**14.30°W**
Ekran 4	1979- 87A	Statsionar-T replacement?	not yet available

a typical orbital lifetime of 5 or 6 years. At the chosen inclination, precession forces are nearly balanced, and the perigee remains constant near 270 degrees. This means that **apogee remains as the most northerly point of the orbit**, from where a large portion of the **northern hemisphere** can be covered. The satellite's motion being at its slowest near apogee, **and in the same direction as the earth's rotation**, means that for a period of **six hours or more** this coverage is available, and with only a few degrees of movement required on the earth station antennas.

So what is the nature of this 'northern hemisphere' coverage? **Which part** of the sky do we need to explore **to find a Molniya?** If we consider all possible Molniya orbits, we find that their apogees all lie on **a circle** a little over 20,000 km radius, **with its center 34,500 km above the north pole**. This circle is in a **fixed** position relative to the earth's surface, and its shape can be drawn upon a view of the sky from any particular point on earth, in just the same way as we can draw the arc of the geostationary orbit.

In diagram one I have plotted on polar graph paper a view of the sky from one particular spot in the United States. This point, at the intersection of latitude 40°N and longitude 95°W has been chosen not because of any concentration of satellite terminals in the vicinity of St. Joseph, Missouri, but as a representative central USA location with 'round number' geographical coordinates. The view is similar to that which would be seen by a camera with a 180° 'fish-eye' lens looking **directly upward** from ground level. **The zenith is in the center** and **the horizon around the edge**. To relate it to everyday experience it is perhaps best to look at the lower half of the diagram at any one time, from horizon up to zenith. To take a different view, the diagram should be rotated to bring the required bit of horizon to the 'bottom' of the picture. (I'm working on Coop to print future **CSD**s on round paper!)

Now starting with southern horizon **nearest** to us, looking south (from St. Joseph) and elevating 44 degrees we come to the geostationary orbit - in fact the highest point of that orbit as seen from our chosen location, the location of Comstar 2 at 95°W. Each side of this point, the orbital arc dips away towards the eastern and western horizons - the orbit meets the eastern horizon at a geostationary longitude of 15°W, and meets the western horizon at the point 175°W on the orbit, so defining the section of the (geostationary) satellite 'parking lot' visible from our (St. Joseph) station. We would certainly not expect to find any satellite TV in the **northern** part of the sky; if we didn't know about Molniya.

Turning the page around, so as to place northern horizon at the bottom (diagram 1) the curve can be seen which represents **our view** of that imaginary circle above the pole: the locus of all possible Molniya orbit apogees. It may come as a surprise, but **the full 360 degrees of this circle are visible from our hypothetical Missouri location!** Like the geostationary curve, I have labelled it in degrees of longitude. The nearest point of the circle is that nearest the zenith, at 95°W. The most distant is at 80°E, on the other side of the pole, and over the Soviet Union. The spot marked **'pole'** is that point on the

HIGH QUALITY Gorizont 2 [Statsionar 4] reception by Birkill this fall on 3695 MHz on 8 foot parabolic with 180 degree K system. This satellite, located at 14.3 degrees west, is visible in eastern half of U.S.A.

celestial sphere **directly above our north pole**, being the position of the pole star, Polaris or Alpha Ursa Minoris. **This star is always due north of us, at an elevation equal to our geographic latitude.**

But what does the circle represent in terms of finding the satellite? The key is in the fact that Molniya satellites are orbited **in groups**, following the same orbital track within a degree or two, **but spaced out along the orbit**. The spacings are such that each satellite need only operate for a period of **6 hours or less**, around its **apogee point**, before service is switched to the **next** one approaching its apogee. So **our apogees circle** is close to being **our zone of interest**. In practice, we should consider this zone to extend some 20 degrees outwards (away from the pole star), and to provide for tracking the Molniyas as they approach the circle, touch it at one point, and recede from it, tracing out small arcs in the sky as shown at A, B, and C in diagram 1, dependent on the longitude of apogee but never venturing inside the circle.

Due to the variations in gravitational field around the earth, the plane of the orbit 'regresses' westward about the earth's axis. For the Molniya orbit the rate of regression is small, being about **0.15 degrees per day**. So in time the longitude of the apogee point will travel right around the earth, getting back to where it started. As explained in December's diagram 2, **each orbital plane** produces **two apogee points** on its earth track, **spaced apart by 180 degrees** in longitude and **12 hours in time**. So a satellite that apogees at 100°W will apogee again at 80°E, 12 hours later. Having placed a group of satellites into such an orbital plane, it is up to the operators of the system to decide how to use these two earth-related apogee points.

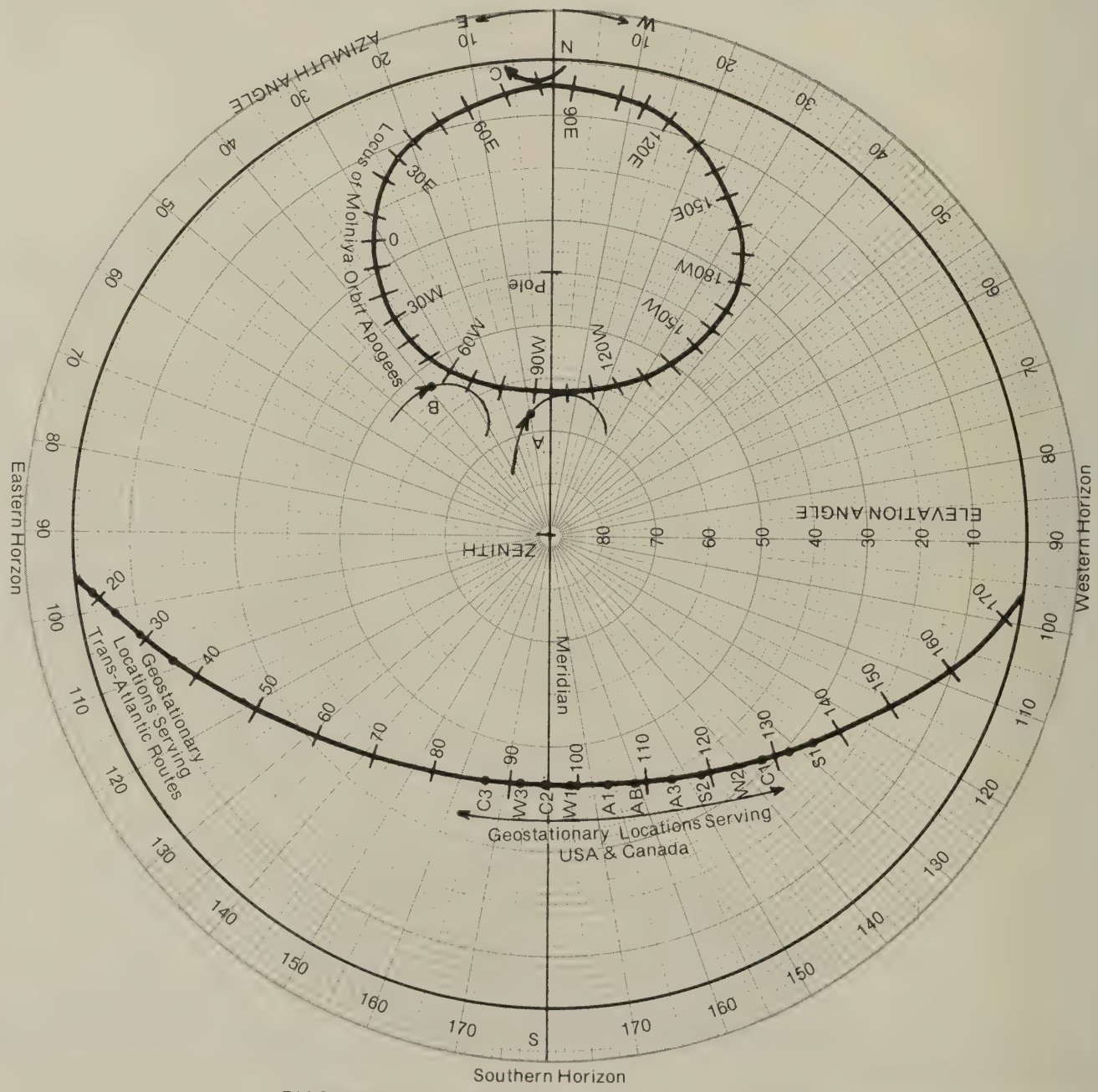


DIAGRAM ONE - View of sky from example location at 40°N, 95°W showing geostationary orbit and Molniya Apogee Circle.

Now it happens that at the time of writing the principal Molniya 3 (Orbita TV) orbital plane has apogees at about 100°W (**over the USA**) and 80°E (over the USSR). Remember that these are regressing westward by some 0.15°/day, but that amounts to only 54 degrees per year, or probably slightly less, so things will not change a lot **during 1980**. Now a surprising fact: my observations reveal that the Russians are using **not** the 80°E apogee, **but the 100•W apogee**[!] for television relay. **So the whole of the USA is covered by** (single channel) **Orbita TV from Molniya 3 satellites.**

So where do I look if I'm not in Missouri? Well, diagram one has longitudes marked on the apogee circle for a location of 95°W. The 95°W is uppermost on the curve. If your location is say Philadelphia PA (40°N, 75°W) then **your** curve will be the same, but its uppermost point will represent 75°W, and your 100°W point will be where 120°W is marked on the Missouri diagram. Similarly, at Denver CO, (40°N, 105°W) your highest point (on the meridian, closest to the zenith) will represent 105°W, and the 100°W apogee will appear 5° east of you along the curve, at the point marked 90°W on the Missouri diagram.

For latitudes other than 40°N, **diagram two** shows a family of curves. It should be possible to interpolate from these with sufficient accuracy for latitudes between 25° and 55° - enough to cover the continental US and much of Canada. For clarity I have not shown the apogee longitudes on this diagram, but they occupy similar relative positions as those in diagram one they can be projected with sufficient accuracy to get within 10° of the satellite, which anyway will have to be 'found' until its degree of progress along its 6-hour arc ('A' in Diagram One) is found. After a while you will come to know these for your location and relate them to time of day, enabling you to pinpoint a satellite immediately. The Orbita stations have regularly updated charts (available in the USSR) for antenna pointing, but I do not have access to these. For interest, Ihave also included on diagram two the four views of the geostationary orbit from the four example latitudes shown, to

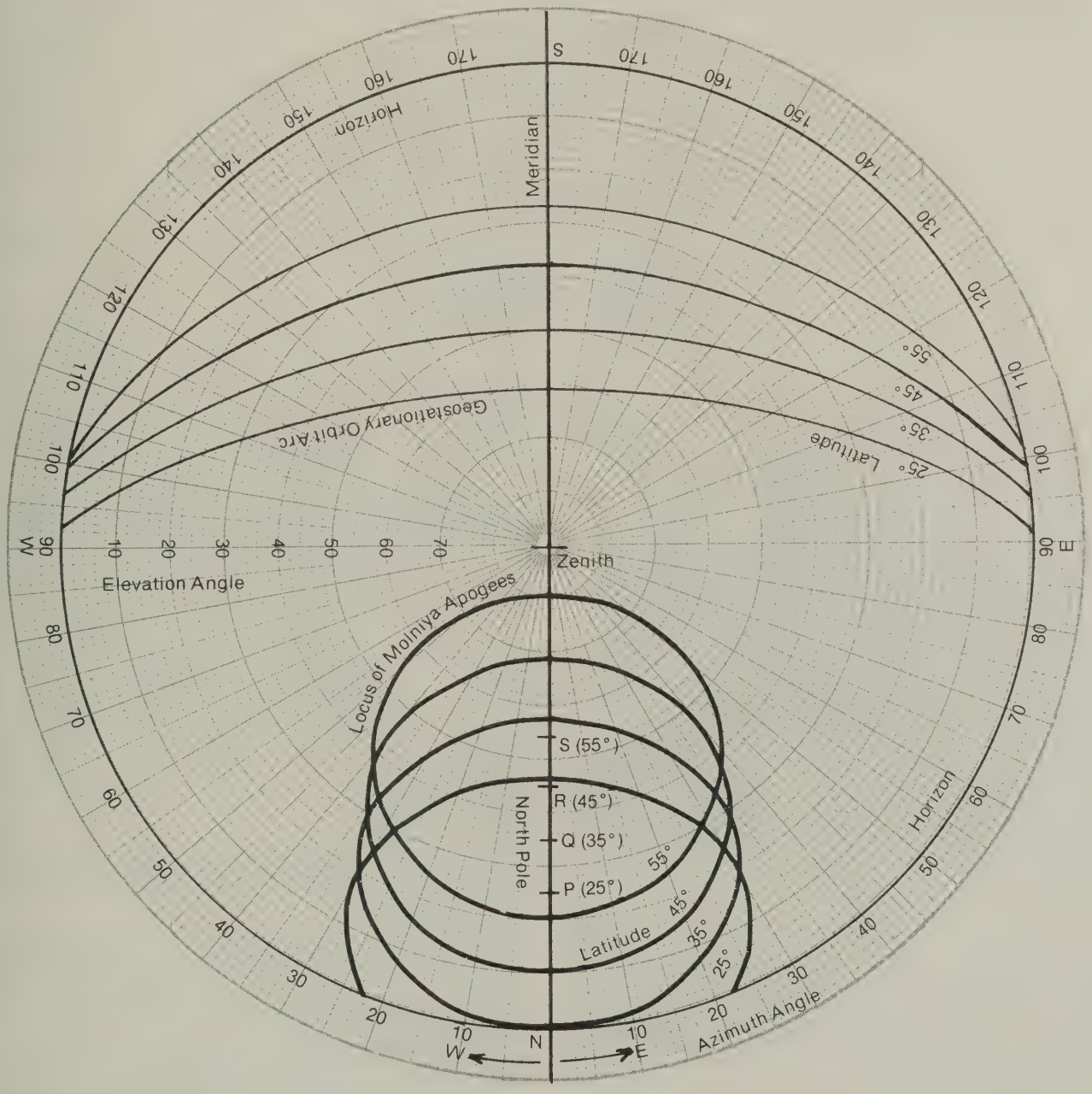


DIAGRAM 2 - View of sky from latitudes 25°, 35°, 45° and 55°

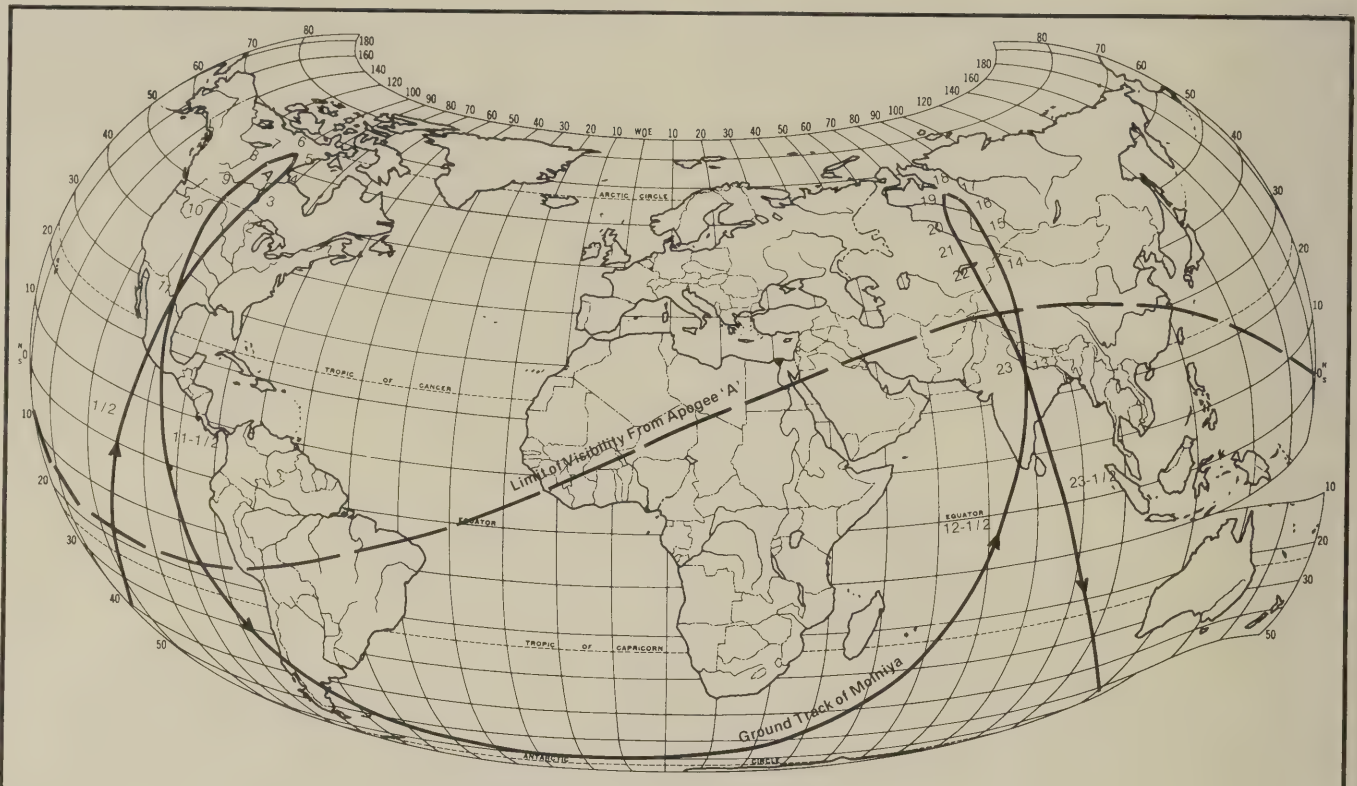


DIAGRAM THREE - Earth track and coverage zone of typical Molniya Orbit

show how its **elevation decreases moving northwards**, while the Molniya elevation increases. At 81.5 degrees north geostationary elevation falls to zero for a satellite due south. At 35°N the most distant Molniya apogee has zero elevation, and at 19°S the nearest Molniya apogee has zero elevation. At latitude 25°N some 100 degrees of the Molniya apogee locus are below the horizon and inaccessible, but this does **not** include the currently active point, A. Four apparent positions of the pole star, P, Q, R and S are also shown for different latitudes.

Diagram Three illustrates all these points **on earth**, rather than sky, **co-ordinates**. I have shown the ground track of an orbit having apogee at 100°W (point A) and 80°E. Time markers in hours (measured from **perigee** over the South Pacific) have been included, to show the apparent slow movement three hours either side of apogee. The dashed line is the southern limit of coverage achieved from apogee A. A similar line could be drawn for the other apogee, but this does not concern us here. **Time of TV transmission**: Due to the fact that the USSR covers many time zones (it is mid-afternoon in the USSR far east before the sun rises in Moscow) **the Molniya system is in action 24 hours per day** carrying programming to some part of the Soviet Union. Electronic test pattern is radiated in the short intervals between program blocks transmitted to different regions. You will find that as each satellite moves **through apogee** there is a half-hour period during which your antenna need **not move**, but the further away it is from apogee, the faster it appears to move, necessitating **an antenna adjustment every ten minutes** at the beginning and end of the 6 (or so) hour period. If the signal **suddenly disappears**, service has been **switched** to the **next** satellite along the orbit, which will be found **approaching from the east** (orbital track is west **to** east, but the loop formed in the earth track results in the active arc at near apogee **moving from east to west**). A few degrees movement should pick up the (next) adjacent spacecraft.

The Molniyas are believed to have an earth-coverage (17°) beam and an EIRP of 29 dBw. If this is an edge-of-earth value we might expect 32 dBw **at beam center**, or perhaps 30.5 dBw in our direction; about the same as Satcom F1's even numbered transponders put into the south-east. So a bit sparkly on the average US TVRO, but a good picture on those with a 3 dB margin.

Now what about transmission systems and frequencies? The USSR uses the 625 lines 50 frame-per-second system, similar to Europe, and with SECAM color. What this means is that pictures **are easily resolved** on a US TV, **but not color**. I will

MAKING MOLNIYA TRACK

Birkill's report detailing how you look for the inclined orbit of Molniya appearing here is based upon observations from his English location plus numerous calculations of the 'published' orbit data. Not everything checks out exactly so there is some room here for independent observations and reports. **Several Molniya orbits exist;** only one appears to be carrying television. That one is detailed here. Others are probably not carrying television (although we don't known for sure) so systematic checking of the northern sky is encouraged.

Birkill has checked for television on the inclined orbit described here at 0000, 0600, 1000, 1500, 1800, and 2100 (GMT) and he finds television operating at all of these times. **Published data** suggests an apogee azimuth at 47° west with an elevation of 48°, for a longitude of 71.5° west. **But** November observations had an average ascending node of 114° west which results in an apogee of 107° west. Thus we suggest looking for apogees around 100 degrees west; a scan **about this point** should pick up the Molniya (of the moment) at some point in its active arc.

Individual observations should be as 'calibrated' in apparent elevation and longitude location as possible. Remember to correct for your magnetic declination when utilizing a compass to establish your (true) north reference point.

examine the subject in detail in a future article. Sufficient now to say that the line (horizontal) frequency is almost identical to that used in the USA, but the frame (vertical frequency is 17% lower - on some receivers or monitors you will need to **adjust the vertical hold control slightly** to stop the 625-line picture 'rolling'. You will also need to **reduce the frame height** to maintain aspect ratio (or things will look tall and thin). **That's all**, except pictures will be in black and white.

Audio is carried on two parallel systems: subcarrier FM, as used on the US domestic systems, except at a carrier frequency of 7.5 MHz; and an analog pulse-width modulated version of sound-in-syncs. **CSD** will publish demodulation details for this in the future.

Frequencies: For Molniya TV, channel **center frequency is 3895 MHz**, lying in transponder 10 in a 24-channel receiver. Transponder 10 receivers will be close enough. This is also the frequency of the Raduga TV transponder, and of **one** of those carried by Ghorizont. The other **Ghorizont channels** are 3695 MHz (not in the US band), 3745 MHz (in transponder 2), 3795 MHz (in transponder 5), 3845 MHz (in transponder 7) and 3945 MHz (in transponder 12). These five are **not** used by Molniya or Raduga satellites.

In all cases, polarization is **right-hand circular**, incurring a 3-dB disadvantage into your linearly polarized horn feed. The Birkill hybrid-mode corrugated horn feed will recover the 'lost' 3dB (see technical report on Birkill feed in this month's Technical Section). A reassurance to Birkill horn constructors: Coop's comments on double-sided PCB material (**Nov.** 79) don't affect its use for **this design** - it is just employed as a cheap, lightweight rigid ground-plane, the 'open' edge being well removed from RF fields, unlike the side-walls of a **rectangular** horn. Note also that a low-loss microwave type material would **not** help in the latter case - its low loss properties would aggravate any resonances it introduced!

My background being in communications technology, rather than orbital dynamics, I must acknowledge Martin R. Davidoff, Ph.D., of Baldwin, MD, without whose book '**Using Satellites in the Classroom: A Guide for Science Educators**' I would not have been able to calculate or plot the orbital paths shown in this article. The book, although principally concerned with the AMSAT-OSCAR amateur satellites, is a very **good introduction** to orbital dynamics an satellite coverage geometry. It is published by **Catonsville Community College, Catonsville, MD 21228**.

UPDATE ON GHORIZONT

The strange positioning of Ghorizont (Raduga 4) between 86.8 and 87.2 degrees west is another mystery. Birkill suggests the satellite is positioned there to provide **not** 6/4 GHz transponder service but rather to provide Cuba with an **8/7 GHz military transponder** for communication between Cuba and both Caribbean islands friendly to Cuba and/or Russian ships operating within its coverage area. Raduga class satellites are known to carry 8 GHz up and 7 GHz down (these are the **bands** utilized, not the exact up and down frequencies) hardware on board.

REAL WORLD TECHNOLOGY MATERIALS

Steve Birkill makes some of his circuit boards and past writings available on a **direct** basis to readers of CSD. All prices are in pounds Sterling which simply means that you must go to your bank and obtain a check/Sterling order in the proper exchange amount (as computed at the time the check is drawn).

2 Stage LNA Circuit Board - As originally described in CATJ for July 1979 and subsequently described in early versions of the Coleman TD-2 Conversion Manual. Board is Chase-Foster Di-Clad 1/32 inch PTFE-glass laminate, etched with the 2 stage LNA circuit but undrilled. Price is 10 pounds per board.

120°K GaAs-FET LNA - using 1 GAT-5 device (originally detailed in CATJ Magazine for December 1979). Circuit board per construction article (corrected) plus design and construction notes, addresses of U.S. component suppliers. Price is 15 pounds. Board is on 0.030'' PTFE-glass laminate.

Consultancy Service - Birkill's unique background and knowledge in the satellite world equips him to find hard answers to hard problems whether North American oriented or world-wide in scope. Consulting by letter only, state your questions and objectives clearly. Response by airmail; price is 10 pounds per letter.

To order any of these Birkill materials, you may write: **Mr. S. J. Birkill, Real-World Technology, 128 Cross House Road, Grenoside, Sheffield, S30 3RX, England.**

SATELLITE POTPOURRI

OLIVER SWAN

OLIVER SWAN

Oliver Swan was possibly the most unselfish person I have ever met. He was also the most industrious, dedicated, hard working person I have known.

His talents and aptitudes for more than 30 years were channeled into things electronic. With virtually no formal training at all he quietly touched the lives of millions who never knew his name and moreover were not even aware of his presence on earth. Tens of thousands of amateur radio operators have made millions of two-way radio contacts all over the world and even outside of this world because Oliver Swan in the early 1950's created a better way to funnel radio frequency signals into one specific direction. Thousands, possibly tens of thousands of people scattered throughout Mexico are receiving their first and only television via antennas and electronics conceived and probably hand built by Oliver Swan. Tens of thousands more all across the United States will today enjoy television reception made possible by Oliver because he unselfishly appeared at cable television trade shows through the years to teach cable system technical

personnel how to design better antenna receiving systems and signal processing electronics.

Oliver deliberately chose to maintain a low profile in life. He chose to return to his family's homestead along the Mexican border near Bisbee, Arizona when his father died because the 160 acre tract of land settled by his grandfather had been painfully wrestled into productivity by his ancestors and he didn't want to see it mis-used or turned back into desert wasteland. From this unpresupposing and often barren piece of real estate he and his family lived a quiet, simple, religious life. Blessed with a near ideal climate far from the ravages of winter and the man-made pollutants of an industrialized society Oliver's genius touched more than 400 of his neighbors because it was Oliver who made it possible for his neighbors to enjoy the benefits of television. Oliver knew he had a special gift and he graciously shared it with all who would ask.

Oliver could do more with less signal than anyone I have ever met. His initial devotion was to antennas. He invented the "logi" (the happy marriage that results when passive directors are added to log-driven active elements) and probably invented the log as well (in 1951). He was certainly the first to adapt both to television reception. Oliver had a rule of thumb. "If I can find and measure 5 microvolts or more on a two element yagi (dipole plus reflector) at a test site, I know that I can build that signal up strong enough with a stacked and phased array of my antennas to give people a good, viewable picture". And so he did at more than a dozen 'CATV' sites in southern Cochise County in Arizona. Over the years more than 400 southern Arizonians would 'connect' to Oliver's very small cable systems although many of these systems were not large enough to qualify as MATV systems (one has but three homes connected) let alone by-FCC-definition CATV systems. Yet each system, whether 3 or 200 homes served, would get the same attention and personal devotion because Oliver considered each viewer connected equally important.

I visited Oliver's home twice in 1979. In February of '79 my visit was largely confined to videotaping Oliver's achievements for later airing on our **Satellite Magazine** program and thereby sharing with hundreds of cable system operators some of the genius of this man. I returned late last August to work with Oliver in gathering together the material one sees in the **Swan Spherical TVRO Antenna Manual** and again we managed to videotape several hours of Oliver's genius. Oliver's health had been a concern to me for several years; his body was carrying a determined and apparently dangerous level of a trace metal which we all need for survival but none of us need in excess. Oliver lived such a healthy life, the food his family consumed was largely grown on their homestead and he neither smoked nor drank, that it was with considerable surprise that I learned late in October that he had been operated on and Cancer had been found. Perhaps because of the excess of trace metal which his body carried Oliver had become a walking textbook on medical technology. He was curious about everything around him and could orate for hours on end about seemingly obscure subjects one never suspected he even knew existed. His mind assimilated everything it was exposed to and in the end his body was apparently no less selective.

Oliver leaves a considerable legacy for those fortunate to have been touched by his genius. His business life was about as untangled as his personal life but there is at least one piece of unfinished business. During my last visit Oliver asked me to help him find someone to take over (as in purchase, lease-purchase) his mini-CATV-empire. I agreed to do so. Oliver perhaps foresaw the future at the point or perhaps he only wanted to have the full time to devote to his TVRO experiments. In any event there is an Oliver-created opportunity here for someone with around $30-50,000 to invest (with the balance payable out over the years) to 'retire' to the solitude and perfect climate of deep southern Arizona and to have his own complex of cable systems to play with. Interested parties should contact me directly at CSD.

Oliver...we miss you.

PROGRAMMING CORRESPONDENCE

SCARED SpIT-LESS?

I read about CSD in the most recent edition of Co-Evolution Quarterly. Now we can have the most exciting thing in electronics in our own home and get the s--t scared out of us by tuning in the REAL honest to gosh stuff that is happening out there before it gets homogenized by the networks and other big brothers. Sign me up. I've got to have one of these things for myself!

H. Robertson
DeLancey, NY

Shame-shame. Tuning in the network news feeds on WESTAR or SATCOM before they get the New York editorial treatment could be dangerous to your health. Cover your dish with a geodesic dome to keep the "germs" away.

NOT IN

In your December issue you reported the following on page P-15-12/79:

> Microdyne-AFC reportedly offering to set up firms as 'distributors' for private terminal sales for $30,000 fee. This covers a demo system plus one in stock for re-sale and some spare parts."

This is completely erroneous and misleading. Microdyne Corporation has no plans, at this time, to set up distributors for this or any other market along the plans you outlined. We request that you print a retraction of this report and, in the future, should you wish to report on Microdyne's plans or activities, please extend us the courtesy of soliciting our input instead of reporting rumors. This we would expect from any responsible journalist.

George A. Bell
Director of Marketing
Microdyne Corporation
Ocala, FL 32672

CSD was told by a would-be distributor in Arkansas that he had a written proposal from Microdyne that stated the package reported. It never occured to us that someone would 'make up' such a letter out of thin air although Bell suggests they did. Of late Microdyne has been very vocal in the CATV marketplace stating that they do not intend to sell private terminals as long as the 'piracy question' remains unresolved. Other trade press reports have noted that Microdyne was planning to announce a $10,000 home terminal package 'about March'. We understand how some cable firms can put pressure on hardware suppliers to keep them out of the private market; the S-A withdrawal of HOMESAT testifies to the presence of such pressure.

PROFITEERING

If unauthorized reception of common carrier signals is illegal, why then does the FCC and the government allow the

sale of common carrier receiving systems? I wrote to the FCC and their response, in brief, was that for the reception to be considered illegal 'profit' must be involved. The word 'benefit' in the law is meant to mean 'profit'. If a championship fight is distributed via satellite for cable systems, there is nothing they can do if I sit in my own home and tune it in. The airwaves are free. Period. However, if I allow my neighbor to come into my home and I charge my neighbor to see that reception, no matter how small the charge, then I am profiting and that is what is illegal. In other words, the FCC tells me that if I do not benefit monetarily from the reception, then it does not constitute that I am taking monetary benefit from another. Non-profit reception of anything in the airwaves can never be considered illegal. However, I know that for now at least the argument will go on and on and on....

Hugh G. Vandegrift
Killeen, TX 76541

There are many strong 'opinions' about as to what 605 really means. Clearly, as Coop indicated in his 'Comment on Programming' on page P1 for November, the law gives us very little counsel as to who has what rights, when. Again we caution users of satellite services to 'be cool'; obtain the written authority of those programmers whose transponders you intend to intercept and stay tuned for what may be a several year series of legal battles to determine just where the law starts and stops in this grey area!

TUNING IN ON SRI-LANKA

I intend to set up a home earth station to receive satellite TV programming at Colombo, Sri-Lanka (Ceylon). I need some advice on how best to establish the receiving terminal, what satellites I can expect to receive, and what equipment will be required. I am an electronics engineer currently residing in Tanzania but will be relocating to Sri-Lanka soon.

M. W. Weerasinha
Tukuyu, Tanzania

Reception in various spots on the globe can be summed up as follows: Virtually any place south of 80 north and north of 80 south you can count on finding at least INTELSAT video. The newer domestic satellites serving nations, continents or regions have more limited coverage areas; but, much stronger [focused] signals. Add to this the ongoing launches of Russian Statsionar series 4 GHz geostationary birds [see Steve Birkill's piece this issue plus our November issue report in the Programming Section) **and you end up with a choice of satellites virtually anyplace. No, HBO is not available in Sri-Lanka! [yet]**

CAN WE SHARE IT?

We live in a mountain community in the eastern Sierra Nevada portion of California at about 8,500 feet altitude. We receive one NBC station through a translator arrangement which is not too satisfactory. There are about 50 people living here.

I would like to obtain information about acquiring or constructing a low cost satellite TV terminal and a rebroadcasting setup for one or two channels of service. it is not practical for us to run cables from the earth station because of the distances involved between residences and the heavy rock formations. What type of problems will we have to overcome? There would be no profit in this at all; it would have to be a cooperative effort. It will simply be for the good of the (50) people living here. Is FCC approval necessary? If needed, is it complicated?

Robert J. Tomko
208 Columbine Rd., Rt. 1
Bishop, California 93514

The FCC would have to be involved if you intended to rebroadcast **the satellite signals from the TVRO site back into the airwaves. In January of 1978 the FCC approved changing the UHF** (that's ultra high **not** very high) **translator rules so that a** (UHF) **translator can get its input signal[s] directly from a satellite. Unfortunately it has only been during the past sixty days that the FCC has actually** granted **such permission to the first would be operator of such a system** (a 1,000 watt UHF translator serving Denver with programming from SIN; Spanish International Network). **Even a ten watt UHF translator on the used market will cost you upwards of $5,000 to put onto the air plus the cost of the TVRO. And that's if you scrounge used everything to do it. A VHF translator on the other hand could be put into operation for between $1200 and $1500;** less if you scrounge. **But FCC rules at the moment don't allow you to** legally **feed a VHF translator with a satellite TV signal.** That is the answer of course...**but we cannot counsel you on doing it and breaking FCC rules in the process. If anyone wants to pursue translator rebroadcasting fed with satellite TV input signals we suggest you begin by contacting a qualified Washington attorney who knows how to get things done at the FCC. Contact Susan Cooper at CSD** (by telephone or letter) **and we'll give you our** private **recommendation in this area.**

RURAL AREA TV

In the November issue of **Electronic Technician/Dealer** there is an article on earth stations describing the events of SPTS '79 in Oklahoma. I own and operate a TV sales and service business in the town of Wausaukee. This is a rural area with a population of 600+ in the village, ten miles south is another village with 1,000 and another ten miles is a third village with 600 people. These three villages and the surrounding countryside have around 6,000 people and the population nearly doubles in the summer as we are a resort area.

I am interested in starting a translator or rebroadcast type TV system. We have six television stations spaced from 65 to 85 miles away and the reception is very marginal most of the time. Can you give me information on setting up an earth station, microwave and a standard off-air system which could

SATELLITE TV EXPERIMENTERS
INTRODUCING A COMPLETE
3.7 — 4.2 GHz DOWNCONVERTER
•3.7-4.2 GHz in, 70 MHz out
•Remote, one co l tuning
•Dual conver ble
•Assembl Only $895.

Polar M ote Feed Rotation
r Dish.
SU ostpaid

EXPEI UPPLIES
•Teflon PC L nstant 2.55
1/16''x9''x3
1/32''x9''x4
•Chip capacitor al! 18, 27, 39, 220, 4700 p.
•SMA and microv quire
•2''x14'' copper tube for Birkhill feed, 3 lbs. $12.00

WRITE - We are adding to our inventory!

SATELLITE INNOVATIONS
P. O. Box 5673
Winston Salem, N.C. 27103

Add $2.00 shipping and handling (except for plans)

THIS PRODUCT NO LONGER AVAILABLE

then be re-broadcast at a VHF or UHF frequency? If it were to be rebroadcast at VHF or UHF, is there a type of ''black box'' a person could sell or rent to a customer so that a picture could be transmitted out of sync and the box would put it back into sync, thereby eliminating people who did not wish to pay for the service?

Parkansky TV
Wausaukee, WI 54177

FCC rules within the United States and territories make it illegal to 'scramble' translator (i.e. rebroadcast) **TV reception for any purpose, including collection of fees for providing the reception. You have two viable options. Build a cable system for each of the three principle communities and thereby control who gets the service by only connecting up those people who pay the rate charged. Or, build an MDS** (multipoint distribution service) **transmitter** (requires an FCC license) **where you can either count on the relatively high frequency** [2.15 GHz] **to keep non-authorized viewers from watching, or you can** (if you wish) **scramble the service** (requiring a 'black box' to decode it). **Cable can be built in a rural-community area for less than $5,000 per cable mile using modern, all solid state gear. If your cable plant can pass 30 or more homes per mile** (averaged over the full system) **you can make a go of it with a 5 to 7 year payout. A commercial MDS installation will set you back around $25,000** (up) **for the transmitter and the hardware per receiver will cost you around $100 per installation. MDS is however limited to a single channel** (although you could program it twenty four hours per day if you choose using multiple signals from the satellite). **Cable rates are typically $7 to $8 per month for 'basic service' with an extra $8-$10 per month for optional premium service** (i.e. HBO, et al). **MDS rates are typically $12 to $15 per month plus a hefty $100 to $150 installation fee.**

Several groups have proposed that the FCC authorize use of higher UHF TV channels for block transmission of multiple channels (say 5) **of TV in a scrambled mode. The broadcasters get very uptight over this however and if anyone ever formally proposes this to the FCC it would probably take 2 to 3 years before acting upon and it would be battled all the way by broadcasters and others** (including, now, cable interests). **If there is sufficient support out there we'll talk about it some more since it may be a concept whose time has come. STT's Bob Cooper is conducting a special seminar session on exactly this subject during SPTS '80 in Miami in February.**

START A BUSINESS

Your SPTS '80 Miami poop sheet indicated several hundred new business ventures are probably being formed in the satellite TV area. How can I find out who is active here in the Washington, D.C. area as a result of your SPTS '79? Have you some names from SPTS '79 from your registration list of people here in this area?

Kenneth S. Dewire
System Consultant
4807 NW 17 Street NW
Washington, D.C. 20011

NEW ICM TV-4200 SATELLITE RECEIVER

Provides You With These Features For $1,995

- Output levels compatible with video monitor or VTR input.
- Dual Audio Outputs 6.2 and 6.8 MHz. • Built in LNA power supply
- Tunable Satellite channels 3.7-4.2 GHz.

International Crystal Mfg. Co., Inc.
10 N. Lee Oklahoma City, Ok. 73102 405/236-3741

We have a simple policy on names and addresses. We don't given them out unless we have the approval of the person named. So we'll list your name and then let people in your area contact you. Which brings up an interesting idea. Suppose people in an area (say within a state for openers overlooking the size of Texas, Alaska and California for the moment) **want to get together to share experiences, project information, and construction data. How do they locate one another? Since private terminals are no longer illegal at the FCC, it seems to us that we could start running a 'help wanted' segment in CSD. If you are working on a private terminal, or thinking about it, and would like to be listed, just drop us your name, address and telephone number along with 25 to 50 words about your background, strong abilities in this area and the state of your project. If enough people in a region could get together, we'd even consider loaning you guys some videotapes from the STT library list for a monthly meeting of the group. Let us hear from you at: c/o Help Wanted, P. O. Box G, Arcadia, OK 73007.**

LIKES WHAT HE SEES

I have been watching a weekly program fed via cable here on satellite television technology and never fail to be fascinated. Unfortunately I find the technical aspects of it all way over my head. Currently I am in the broadcast programming field and leave to engineers what they do best. Is there a book or article you could suggest that is not too complicated, and capable of enlightening me about this field? Already somebody has directed me to CATJ but I found it largely concerned with cable television. I need a general, overall picture of what this satellite revolution is all about. Keep the show on satellite; I am a devoted if confused fan!

Gregory S. Wilson
Ft. Myers, Fl 33901

Coop's weekly television program, Satellite Magazine, is distributed on RCA SATCOM FI Thursdays at 12 noon eastern on transponder 21. According to SPN (the folks who operate transponder 21) **there are now more than 550 'communities' with something in excess of 1,500,000 'homes' receiving the service.However approximately half of the systems carrying SPN do so only for a portion of the day utilizing SPN programming as a 'filler' during those hours when some other service** (such as HBO) **is not operating. Satellite Magazine has noted a dramatic increase in viewer 'mail' in recent months and SPN seems headed for several million 'homes' on the circuit before we are very far into 1980.**

SIN IN BRAZIL

I am interested in acquiring a satellite EIRP dBw contour map for transponder 7 of WESTAR II. In particular I would like to have the footprint for as much of Latin America (especially Brazil) as possible.

Gary Christopherson
Gamma Development Corp.
Chase, British Columbia

Sorry, The WESTAR footprints simply don't go very far south. Even the WESTAR III footprints (see **CSD** for December 1979, page P15) **don't make it into northern South America except at levels in the 22-24 dBw region** (according to Western Union data on file with the FCC). **Taking the SIN Spanish language television into remote regions of South America is a great idea** (they are on transponder 7 of WESTAR II) **but unfortunately the signal levels are not there to support it...if the FCC filed maps are accurate** (there is always the chance they are not!).

PARLEZ VOUS FRANCAIS?

I am a technician (a French native) living in southwestern Michigan and a subscriber to **CSD**; a great magazine! In your October issue, page 15, you talked about ANIK-B and the 11/12 GHz footprint. I am very interested since I would apparently locate in a good footprint area for ANIK-B and have restricted space to install my own TVRO. A 1.2 to 1.5 meter dish for 11/12 GHz would be ideal for my situation.

Can you supply the address of SED, the Canadian

BELIEVE IT!

NEC/CEL's world-famous 4GHz GasFETs and NE64535 silicon bipolar transistors are offered at reduced prices to qualified experimenters and hams.

GasFETs:	NE24483 1.5dB NF/13.0dB GNF at 4GHz	**$35.00 each**
	NE38883 1.3dB NF/13.0dB GNF at 4GHz	**$50.00 each**
Bipolar:	NE64535 10.5dB MAG at 4GHz	**$13.00 each**

Immediate delivery. Contact California Eastern Laboratories, Inc., or the CEL sales office nearest you.

NEC microwave semiconductors

California Eastern Laboratories, Inc.

Exclusive sales agent for **Nippon Electric Co., Ltd.** Microwave Semiconductor Products. U.S.A. ☐ Canada ☐ Europe

Headquarters and Warehouse California Eastern Laboratories, Inc., 3005 Democracy Way, Santa Clara, CA 95050, (408) 988 3500 • **Eastern Office** California Eastern Laboratories, Inc., 3 New England Executive Park, Burlington, MA 01803, (617) 272 2300 • **Southwest Office** California Eastern Laboratories, Inc., 4236 North Brown Avenue, Scottsdale, AZ 85251, (602) 945 1381 • **Southern California Offices**—California Eastern Laboratories, Inc., 2182 Dupont Drive, Suite #24, Irvine, CA 92715, (714) 752-1665 California Eastern Laboratories, Inc., 2659 Townsgate Road, Suite 101 6, Westlake Village, CA 91361, (213) 991 4436 • **European Sales Offices**—California Eastern Laboratories, U.K., 2 Clarence Road, Windsor, Berks SL4 5AD, England, 075-35-56891, California Eastern Laboratories, France, 34 36, rue des Fusilles, 94400 Vitry sur Seine, France, 681-61-70

manufacturer, that has built the 11/12 GHz receive terminals? Or, could I get some type of 11/12 GHz TVRO terminal here in the USA for ANIK-B reception? Do I have to obtain permission from the French Canadian CBC network to receive their programs in the USA?

Andre Polizzi
Grand Rapids, MI 49504

SED is in Saskatchewan. They are NOT **a very cooperative firm. Downright unfriendly would be a better description. They 'think' they have the Canadian 11/12 GHz market all wrappedup and we assure you that they will not do a thing which might cause** political **repercussions in Canada to endanger their hold on Canadian 11/12 GHz receiver contracts with the Canadian government. Anything includes selling a receiver to a stateside viewer. Why watch French Canadian TV on ANIK-B's 11/12 GHz channel? The same program runs on the 4 GHz channel** (transponder 8) **of ANIK-B and for some unexplained reason the ANIK-B footprint seems skewed badly; to eastern stateside advantage. ANIK-B on 4 GHz is 3 dB hotter** (10 watt output) **than ANIK-3 or U.S. SATCOM's and that means that in the boresight a 1.83 meter** (6 foot) **antenna it is well above noise. In Michigan we'd expect you to find the ANIK-B 4 GHz channels so** hot **that a 6 foot with a 120 LNA would be 'perfect'. With a 12 foot + 120 LNA in far-southern areas** such as Miami **they are noisefree!**

BIRD OPERATIONAL NOTES

Canada's much ballyhooed 12 GHz experiment is basically just that; **an experiment**. Service now includes Vancouver CBC network feed plus recent addition of CTV network station CHAN. **Very few** terminals have gone to private homes; those that have are for 'show' and publicity value. Most of the approximately 100 installed are at community centers or far northern low power TV stations or far northern cable systems dependent upon ANIK for CBC programming in the Northern service. Present terminals are custom ordered by Canadian Department of Communications from Saskatchewan SED firm. SED has been quoted as saying terminals could be produced "for as low as $500 in quantity..." but present small orders and customized packages probably are costing DOC ten to twenty times that each. **Official** experiment runs only until end of March. Service is using two of four available ANIK-B transponders; most receivers delivered to date have been single channel for **either** CBC **or** CHAN feeds. Project is laudable but significance is primarily political and technological (Canada has aspirations of becoming world supplier of 12 GHz direct-to-home satellites and hardware).

COMSAT's proposal for U.S. domestic 12 GHz direct to home service is getting plenty of headlines (see **Coop's Comment on Programming**, this issue) much of it overlooking the fact that Congress, FCC and many others must approve program before it can 'fly'. COMSAT admits homeowners won't see first terminals "for three, possibly four years"; a projection **CSD** considers overly optimistic at best. Danger with COMSAT proposal is that it may slowdown rapid advances in 4 GHz technology since publicity seems to be creating impression it is coming sooner than is likely.

European groups continue efforts to get together on a 12 GHz broadcasting satellite plan. Latest has French and Germans cooperating, with 1983 launch date forecast.

Modern Cable Programs (transponder 22 daytimes ahead of HBO sign-on) changes name to **Modern Satellite Network** February 1st. Service averages 5 hours per day showing 'free-be' type films.

HBO is raising rates to cable systems up to 25 cents per home per month. Most HBO contracts call for 50-50 split with cable operators of premium rates collected.

SHOWTIME is adding 3 more hours per day to programming schedule (9 to 12) but Warner's MOVIE CHANNEL remains only 24 hour per day premium service for time being.

Seven Alaskan communities (Wrangell, Nome, Kotzebue, Petersburg, Kodiak, Valdez and Cordova) will get Anchorage TV relayed via SATCOM FII (assuming there is transponder space for the service) fed to local low power re-broadcasting stations. FCC has approved service to be conglomerate of Anchorage source stations.

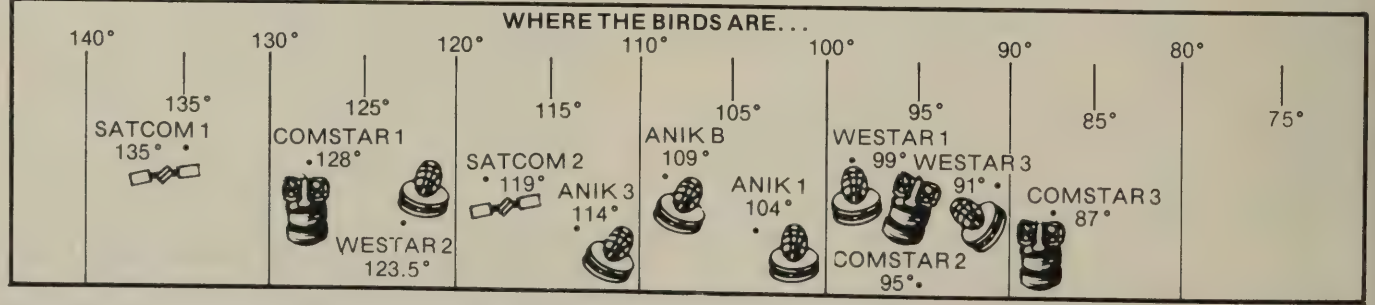
INTELSAT predicting they will be 'sold out' for available TV relay time during peak periods of Moscow Olympics. Most intriguing view of Olympic games may come to U.S. viewers **tuned in directly** to Russian **Molniya** satellite (see feature report this issue, Programming section).

TIME-LIFE six hour per day feed of BBC and other British TV will cost cable systems ten cents per subscriber per month. Feed will actually be three hours long, repeat completely for western time zones. Transponder 20 is likely, start date April 1st.

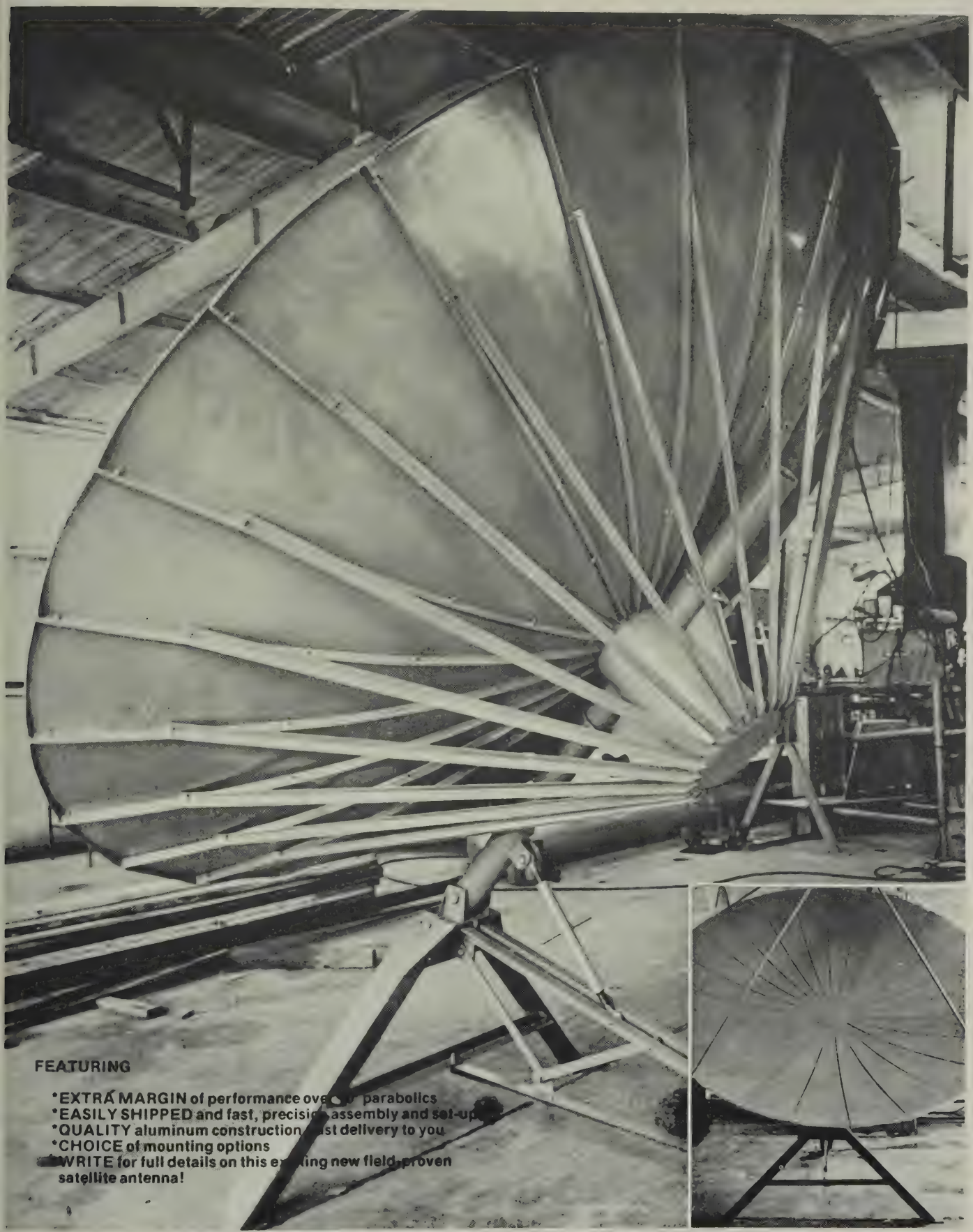
Las Vegas and Reno now reportedly have no fewer than 12 operating TVROs at Casinos. Most are carrying ESPN to residents in hotels attached.

American Educational TV Network (AETV) has announced it will transmit educational service using transponders 10 and 12 prior to SHOWTIME daily programming before April 1st. Service designed to assist doctors, dentists, realtors, nurses, and others who must maintain professional licenses through ongoing education. This suggests anyone in that category could '**write-off**' cost of terminal; presents interesting marketing opportunities for firms selling terminals. Information from AETV at 213-590-5691.

Ted Turner bought private terminal for news chief Daniel Schorr (who will head Turner's Cable News Network) as present at Christmas.



INTRODUCING: ADM's ELEVEN FOOT SATELLITE ANTENNA



FEATURING

- *EXTRA MARGIN of performance ove[illegible] parabolics
- *EASILY SHIPPED and fast, precisi[illegible] assembly and set-up
- *QUALITY aluminum construction[illegible]st delivery to you
- *CHOICE of mounting options
- *WRITE for full details on this e[illegible]ing new field-proven satellite antenna!

ANTENNA DEVELOPMENT AND MANUFACTURING, INC.
2745 Bedoll Av., P. O. Box 1178, Poplar Bluff, Mo. 63901
Telephone (314)785-5988

THE TVRO RECEIVER

YOU'VE DREAMED OF...

...IS HERE AT LAST!

The WASHBURN RECEIVER

1]**FULL TWENTY-FOUR CHANNEL** remote control operation. Automatic rotation of your feedpoint antenna to achieve instantaneous selection of both vertical and horizontal transponders. Hand-held remote control for transponder selection and volume control.

2]**EXTENDED THRESHOLD DESIGN** provides sparklie-free reception for CNR (carrier to noise ratio) of 8 dB and above while maintaining full i.f. and video bandwidths with very high standards for maintaining true high fidelity video reproduction through careful control of video phase and amplitude linearity.

3]**EXCELLENT AUDIO PERFORMANCE** with a true low-distortion, low-noise high fidelity output and automatic selection of either 6.2 and 6.8 (changeable) aural subcarriers including LED indication of the aural subcarrier selected.

4]**HIGH PERFORMANCE AFT SYSTEM** for super stability as well as a very high overall 30 Hz dispersion waveform cancellation.

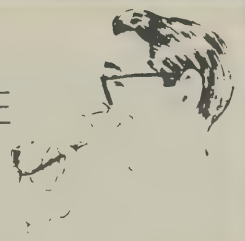
5]**VTR COMPATIBLE INPUTS** and outputs to provide for easy back-feeding of a home or neighborhood MATV system and simple recording functions without the requirement of extra switching and external customized system lash-up.

6]**CIRCUIT BOARDS, PARTS KITS AND MODULES** are available **NOW** to get you started promptly in duplicating your own extremely high performance Washburn Receiver. Through Ramsey Electronics a full range of circuit boards, parts kits and even modules wired and tested are now available. **PLUS** - each purchaser of The Washburn TVRO Receiver Construction Manual can utilize the available services of designer Clyde Washburn to help out where required.

The **Washburn TVRO Receiver Construction Manual** is the latest in a series of highly useful manuals from STT. **This manual**, like the Washburn receiver, is evolutionary. Large 'fold-out' schematic diagrams, complete actual-size circuit boards, extremely detailed assembly and alignment instructions are supplemented with a highly informative 'tutor-text' that carefully explains to the user the decisions required for each TVRO location in selecting antenna size and LNA noise temperature for the grade or level of performance the user desires. This brand new STT manual is available NOW. Get your own copy via first class mail by ordering with the yellow order card in this issue of CSD. If you are attending SPTS '80 in Miami, see this receiver in operation at the Ramsey Electronics booth (#15) in the Exhibit Hall.

Washburn TVRO Receiver Manual is $40 per copy from:
STT, P. O. Box G, Arcadia, OK 73007 [405-396-2574]

COOP'S SATELLITE DIGEST

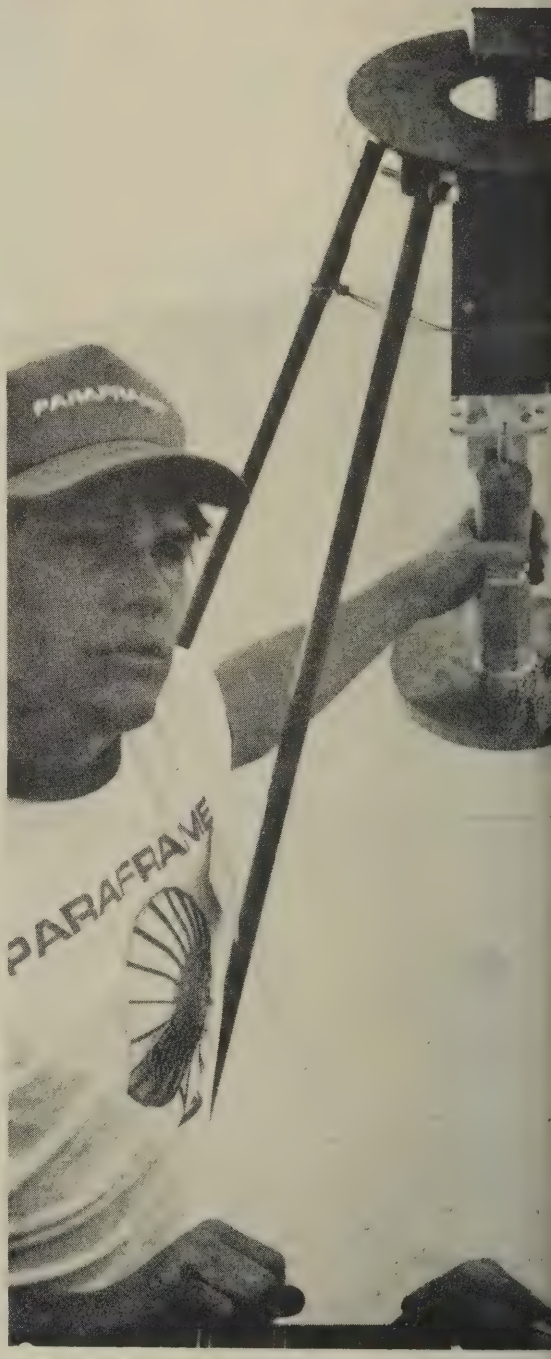


MARCH 1980

INSIDE THIS ISSUE

The Gold Rush Begins
SUPER-NEW TECHNOLOGY AT SPTS!
Flanges/Rotation Systems
DESIGN NOTES ON FEEDS
Satellite Terminal Marketing
SPTS '80 OPENS THE DOOR!
Jim Vines on The Road
IF THIS IS HIXON - 'AY!

PARAFRAME



ITELSAT. If you are planning to work with EIRPs as low as INTELSAT's 26 3w hemispheric beam, you need the high precision, structural strength and ean-gain of a BIG ONE from Paraframe. At Paraframe we do the big jobs ery day; 12 foot, 15.9 foot and soon 24 foot high performance parabolas.

ITELSAT. The real test of a small system private terminal. At Miami's PTS '80 the big ET/4.85 (15.9') high-precision parabolic by Paraframe livered the impossible; Sao Paulo, Brazil via Intelsat IV-A (FI) parked over e Atlantic at 24.5 degrees west!

FESTIVAL 15 ANOS

INTELSAT IV-A (FI)/Sao Paulo/At SPTS

PARAFRAME

1000 Sunset Drive West / P.O.Box 423 • Monee, IL
[312/534-7435]

COOP'S COMMENT ON TECHNOLOGY

RECOGNIZING ASSOCIATES

One of the subjects of conversation heard on several occasions at the recent SPTS Miami was the passing of Oliver Swan and how short sighted we would all be if some lasting memorial to Oliver's work and his memory is not established.

I learned of Oliver's passing via two-way radio. Susan called me on our VHF intercom to tell me the sad news. Several minutes later I realized that as I had been driving down an Oklahoma City street and receiving this sad news that the transmitter Susan was talking on was attached to an antenna...designed and built for me by Oliver many years prior.

To most of the satellite industry Oliver was a person who figured out a better (and cheaper and simpler) way to extract 4 GHz satellite signals out of the air. To a handful of people who have come into this new industry from the battlefields of cable television Oliver was also the chap who showed hundreds of cable engineers and technicians how to build better antenna systems and lower cost solid state amplifiers. To still others, like myself, Oliver was a very creative designer of antennas for HF (high frequency) VHF and UHF communications.

How do you create a memorium for Oliver? Let's return to that question a little later.

Recently we received a note from an old timer in the satellite business pointing out to us that there is a movement underway in Intelsat circles to have the geostationary orbit belt renamed after Arthur C. Clarke. The concept is straight forward enough and there is ample precedence for such an action. Years ago Megacycles were renamed Megahertz after the first man to recognize the principle of electromagnetic waves. Electronics is filled with such memoriums; the henry, the farad, and yes the ohm to name three we all work with daily. There is no serious contention as to **which** person first recognized the importance and feasibility of the geostationary orbit belt. Our October **CSD** reprinted the 'original' Arthur C. Clarke proposal for use of the geostationary orbit belt for 'space relay', as it appeared in the English publication **Wireless World** for October 1945. This formal publication was preceded by an internal memorandum dated May 25, 1945 from Arthur to a superior. The May 25, 1945 memo has survived the intervening years and during WARC '79 and a preceding trade show (TELECOM '79) an elegantly created poster was distributed by INTELSAT containing the **original** Clarke **memo**.

I suppose we could wait around for some August body of opinion makers to create a committee to study the feasibility of formally renaming the geostationary orbit belt the 'Clarke Orbit Belt'. We could...but we won't. I figure that may take them a couple of years and when they finally get around to doing the inevitable we'll have millions of additional laymen brought up thinking this magic circle above the equator is called geostationary when in truth it is called Clarke. So in our own small way we'll re-name it now; not because we have a special authority to do so or can in fact direct world opinion makers in this area. But rather because this is the right thing to do and sooner or later it will be done.

That means **we will make** changes in our Home-Satellite TV Reception Handbook, our Worldwide Communication Satellite systems wallchart, and of course here in **CSD** and in our manuals. And for awhile we'll footnote 'Clark Orbit' with an explanation of the man this magical circle is (re)named to honor. I think that those of you who write or speak on satellites should do the same, starting right now.

Now returning to Oliver Swan. His contribution to our science were much more general than Clarke's hypothesis; his impact on all mankind perhaps less dramatic than the 'Clarke Orbit Belt'. The closest I can come to pinning down an effect which Oliver first set forth is in the area of directional antenna arrays. Each time I write that Oliver invented the Log antenna I get several nasty letters from people who believe this work was first done by the University of Illinois or some other theoretical institution. Yet nobody writing such angry letters to me seems able to document that they did it prior to (or even near to) Oliver's development of a Log antenna in Stockton, California in 1951. So I remain unconvinced that anyone created a Log (or a Logi - the marriage of log periodic elements to passive yagi directors) **before** Oliver did so. That suggests that it might be appropriate to rename the Log the 'Swan' (antenna). Gaining widespread acceptance of this permanent honor for a man who was not a member of the IEEE (which passes upon such things) might be a foolish waste of time however.

So whereas we can "create" the 'Clarke Orbit' and make it stick through the simple subterfuge of putting it into use and then duplicating the usage millions of times in print, I'm afraid finding a similar honor for Oliver Swan may be more difficult. Suggestions? I'd like to hear them!

OUR COVER

HIXON, BC TURN ON - neither darkness nor numbing cold could stop this intrepid crew from completing installation of a new TVRO terminal for the community of Hixon, British Columbia. See page P2 this issue.

COOP'S SATELLITE DIGEST (Technology Edition) is produced monthly by Satellite Television Technology, P.O. Box G, Arcadia, Oklahoma 73007 (405-396-2574). CSD is available in two separate editions (Technology and Programming) or as a combined subscription. Subscription rates are $30 per year for first class mail delivery within U.S.A. or Canada for either edition, or $50 per year for the combined editions. Outside U.S.A. add $25.00 per year for any subscription. All subscriptions to be paid in advance in U.S. funds drawn on a U.S. bank; no invoicing. Contents are copyright 1980 © by Satellite Television Technology and any duplication or reproduction in any form without written permission is a violation of Federal Statue (17 USC 101 et seq.).

SPTS '80 REPORT FANTASTIC NEW TECHNOLOGY!!!

They came from all over the world. From Austrialia, from Japan (the NHK network sent a film and reporting crew), from Africa, Europe and more than 75 attended from the Caribbean, Central America and South America. The crowd total was almost exactly equal to SPTS '79 in Oklahoma; give or take a few, the final count showed around 550 people had registered and attended.

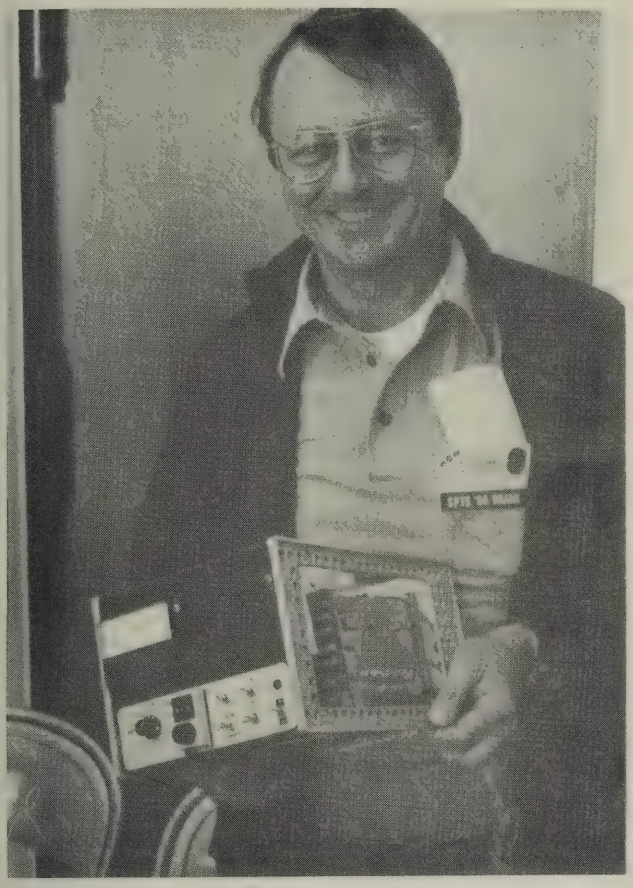
They came to discover whether the American created, American bred and American nurtured low-cost satellite terminal revolution could be 'exported' to their country. They came from Canada in droves, convinced that American domestic satellite reception was going to open up vast areas of Canada to real-world television. They came from throughout the United States including Alaska and Hawaii to investigage both home terminals for their own residences and the opportunities to distribute home terminals in their regions of the United States.

They came from professional firms and universities. People employed by firms that envision utilizing their own private uplinks were on hand to learn more about the low cost receive-only terminal. Example: An engineer associated with a seven state upper mid-west power grid cooperative was on hand to investigate controlling peak loads and switching systems via satellite inter-connection over his seven state area.

No, it was not a repeat of SPTS '79. Several people who attended the original SPTS last summer in Oklahoma indicated that there will never be another one like the first. Indeed there will not. The magic was still there but the entrepreneurial business world was there too and that presence affected every session and every private discussion.

Is the fun and games for private individuals who only wish to build their own private terminals all over? Hardly, it has barely begun. Taylor Howard and Robert Coleman will see to that. Howard and Coleman, who first met at SPTS '79, have now pooled their efforts to create several new innovations in receiver technology. Tay Howard proudly showed off his latest 'Howard Terminal Receiver' system, a nifty little package that features a double conversion technique with a phase lock loop demodulator and selectable audio subcarriers. Combined with Coleman the two are entering the commercial world with the new updated receiver design; offering complete circuit board

JAMMED WITH PEOPLE - the exhibit hall was always busy and always open [or so it seemed!]. More than 20 displays occupied booths from 100 square feet to 900 square feet each.



NEXT GENERATION HOWARD - Tay Howard proudly shows off his miniaturized 4 GHz latest receiver package. A built-in speaker allows you to utilize the receiver at the dish for quick identification of transponder sources without having to haul a video monitor outside.

PIONEER ROBERT COLEMAN chats with Randall Odem of H&R Satellite Systems in front of that firm's 10 foot home TVRO antenna system.

sets (including parts sourcing and parts layout documentation initially) at SPTS. Will this receiver end up in commercial production? Both Coleman and Howard smile and avoid a direct answer on this question but we are forecasting that by SPTS '80 in California this summer the receiver **will be** in commercial production. Several people offered Howard outrageous amounts of money for the model he brought with him to Miami and after being approached by numerous firms that indicated they would purchase 100 or more of the receivers the decision not to produce them commercially became very difficult indeed.

The presence with booths of Avantek, SCI and Dexcel was a prime indication that the 'private' or 'low-cost' (the two may **not** be the same) marketplace is starting to amount to something. As a companion report in our Programming Section indicates, substantial orders were written on the floor of the exhibit hall totaling nearly $2,500,000.

Receiver technology dominated the technical portions of the show. During INTELSAT reception tests (see Programming Section, this issue) it became evident that when you are dealing with **below**-threshold reception the PLL demodulator has an edge over conventional discriminators; at least those on hand. In complete fairness however when the system has achieved threshold carrier input levels, the fine-grain picture detail with conventional discriminator systems (such as the AVCOM) produce a more pleasing to the eye picture. The exception to this quick rule-of-thumb **might** turn out to be the Washburn receiver system which developed some operational problems before the single unit brought to Miami was made totally operational. Tests made by Washburn indicate that his approach to the phase lock loop demodulator may offer the best of both worlds; high sensitivity on below threshold signals and high picture definition on signals at or above threshold.

Clearly the PLL demodulators have constantly been improved since the first Howard Terminal manual appeared in 1979. There have been no major technological breakthroughs in this area; only constant (and still on-going) refinements which bought a few tenths of dB here and a half a dB there. And the improvements have come from dozens of engineers and technicians each working on their own, and then sharing their results and experiences in private conversations at SPTS events.

There was much discussion both during seminar sessions and privately about the LNA bottleneck. We can't pin our prognostication on any singular effort but we feel strongly that by SPTS '80 in California we'll see a price breakthrough in this hold-out from the commercial terminal world; that there will be cost effective LNAs in the 120 degree K area available in the $750 region. We base this fearless forecast on two factors; **the people** who are working on the problem at both professional/commercial and professional/private levels, and, the sudden dramatic **decrease in pricing** on GaAs-FET devices. The day of the $20 1.0 dB noise figure GaAs-FET may not be far away. And that will hardly be the bottom of this technology.

Antenna technology at SPTS '80 was truly exciting. The Paraframe antenna, which has become something of a 'standard' in the industry for 'stout' looks like it may broaden out into larger apertures. Jim Vines is seriously considering a 7 meter version after witnessing the results with his ET 4.85 (15.9 foot) model on the INTELSAT reception experiment. In

the knocked-down-for-shipping area the ADM 11 foot produced good quality pictures and attracted plenty of interest. The J.E. Thomas Lindsey Specialty Products 11.5 foot was transported to Miami in the back of a station wagon (which says something for its shipping size). John Thomas knows as much about metal bending as anyone in North America and his unique mount system has a lot of appeal. The smallest package at SPTS '80 was the Chaparral Communications (P. O. Box 832, Los Altos, CA 94022) 10 footer. Robert Taggart, who originally conceived this design back in the early 70's while earning his Ph.D. at Stanford demonstrated that he can knock the antenna down so that it can be shipped anyplace in the United States via UPS or parcel post for under $50!

Those firms with one or two piece antennas (largely fiberglass based) found business brisk. H & R Satellite Systems had a pair of antennas operational; a ten footer and a 16 footer. The Miami Bayfront Park Auditorium was 'blessed' with severe terrestrial interference from a fully loaded 3.7 to 4.2 GHz 'Ma-Bell' link less than 1.5 miles southwest of the site. Utilizing the Bayfront building as a shield, it was possible to boresight on FI without looking **directly through** the elevated (and line of sight save the Bayfront building) Bell terrestrial circuit but Bell 4 GHz energy sprayed sideways and backwards off of the tall downtown Miami buildings making 'clean' FI copy difficult. While many antennas parked on WESTAR or even ANIK B the adventuresome went after FI. H & R's pictures from their 16 footer were far better than one would expect in that environment and low EIRP level. Another antenna seen for the first time in public, STAR Antennas displayed a foam-fabricated 13 footer that was mounted on a low cost but extremely clever polar mount. The motorized antenna produced high quality pictures from FI on west through the orbit belt and as the companion Programming Section report notes, was the first to 'find' the INTELSAT bird at 24.5 degrees west.

VERY NIFTY - John Thomas [left] directs final assembly of his firm's 11.5 foot parabolic brought down from Lindsey Specialty Products in Canada.

A MUSHROOM PATCH UNDER CONSTRUCTION - An even dozen TVRO antennas from 10 to 16 feet in diameter filled to overflowing the parking lot of the Bayfront. This scene was Monday afternoon, just hours away from the Seminar opening.

ASSEMBLING THE BIG ONE - Paraframe crew hard at work in the South Florida sunshine rushing to get the ET/4.85 antenna operational.

OVER THE TOP - A.B. Electronics Bob Behar [foreground, left] hops over the wall to bring their hardline indoors to their booth. AB's VHF Engineering Division showed off new 24 channel frequency agile receiver priced in $1800 region.

Many attendees were nervous about the 'gain claims' of the antennas on hand. Ideally, it was suggested, all of the antennas would be lined up on a single bird and then with a power meter the antennas would be compared utilizing a single (swappable) LNA and receiver. As you might suspect such a direct comparison is frought with both technical measurement difficulties and is never likely to come off simply because some of the antenna suppliers are **themselves** uneasy about their own gain claims. The next best thing to controlled measurements under antenna-test-range conditions is of course the direct bird-by-bird comparison of each antenna at a

A MUSHROOM PATCH IN OPERATION - from SATCOM FI [H&R antenna in front] through the orbit belt including ANIK B, SATCOM FII, the WESTARS and on east to INTELSAT IV-A FI the antennas dragged in pictures from throughout the world.

CANADIAN PIONEERS - Jan Spisar [left], David Brough [right] with ADM's James McGowan inspect reception on ADM's 11 foot antenna.

TV OUT FRONT - Gene Martin of Star Antenna [right, facing camera] explains his firm's polar mounted 13 foot antenna with the aid of a receiver and monitor set up at the antenna site.

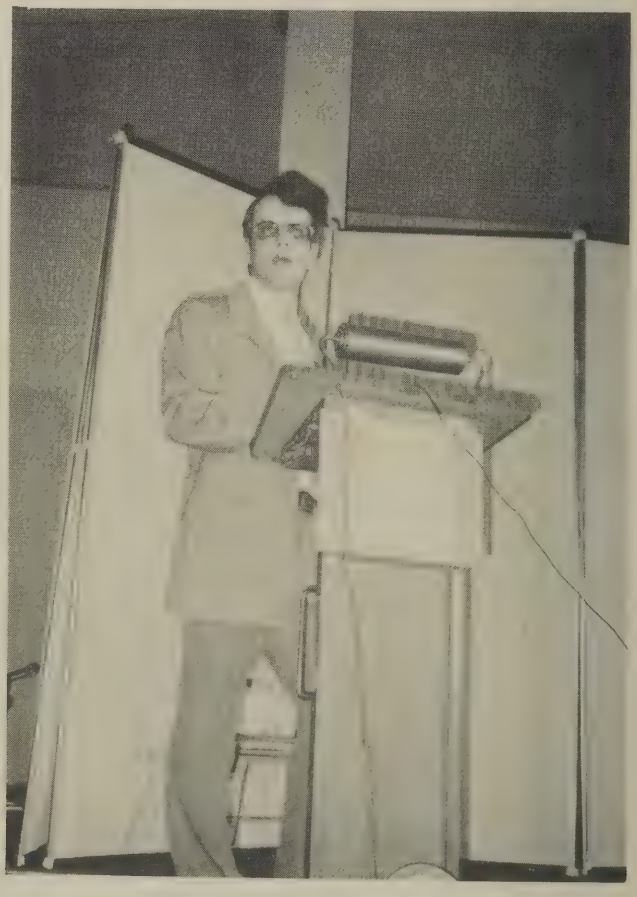
gathering such as SPTS '80. Many people did this on their own, moving from exhibit booth to exhibit booth and asking the exhibitors to run their antennas (where practical) through the orbit belt. Those exhibitors with the capability of remotely changing birds (with motorized mounts) clearly had the edge on those who did not simply because of the wide interest in different programming formats on the part of the attendees.

We forecast that at future Seminars virtually every operational antenna system will be so equipped.

If you are bottom line conscious, here are the latest set of numbers courtesy of the products on display at SPTS '80:

1) **Antennas** - You can acquire a ten foot surface for beween $750 and $850 from firms such as Chaparral or H&R. Feeds and mounts come extra.

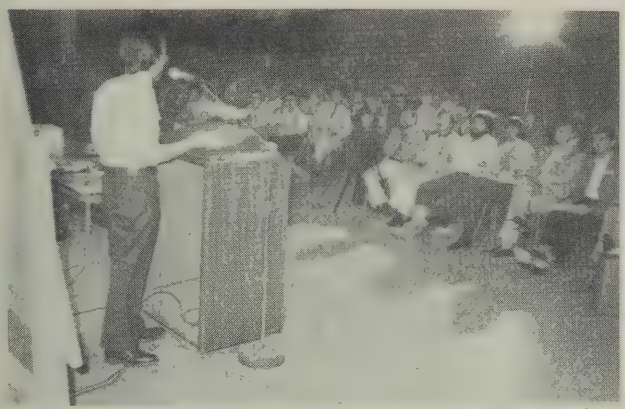
ADM'S JAMES McGOWAN - The front parking lot filled up with antennas quickly and ADM [plus Lindsey] had to set up along the east side of the Bayfront Auditorium.



CLYDE WASHBURN ON STAGE - The new high performance Washburn Receiver attracted plenty of interest in spite of some operational problems with the unit on hand at SPTS.

THE NEW AND THE OLD - An interesting mixture of fantastic new technology [SPTS] plus valuable old collectables [antiques] shared the marquee of the Bayfront. Several attendees noted that as fast as this industry is moving some of the 'new' hardware on display in Miami may be relegated to antique status itself by next year!

BOOTH AFTER BOOTH - Avantek was there in force showing off LNAs plus devices such as the popular VTO series oscillators. DEXCEL and SCI rounded out the LNA suppliers displaying their products.



SHUCH AND PACKED HOUSE - H. Paul Shuch found hundreds of people interested in the technology of low-cost TVRO receivers and his latest receiver version did an excellent job on the marginal INTELSAT signals [see Programming Section, this issue CSD].

ONE MAN PER FOOT - Raising the 16 foot H&R fiberglass antenna into position brought out 16 volunteers. Nearly sparklie-free reception from SATCOM FI was achieved with this antenna even in Miami's low EIRP area.

2) **LNAs** - The pricing still seems to hang between $995 and $1200 for 120 degree K LNAs. Dexcel's 30dB gain model is lowest while 50 dB gain versions from Avantek and SCI are but a couple of hundred dollars more.

3) **Receivers** - Wired and tested radios range from $1800 (A.B. Electronics/VHF Engineering) to around $2700 (Washburn receiver through Ramsey with 'manual discount).

Thus a person could acquire the three basic elements for a commercially produced terminal for as little as $3550 and then plan to spend another $500 or so to complete the terminal with an antenna feed, mount, hardline and concrete. From this bottom-line the prices go all the way up to over $15,000 for completely installed turnkey systems.

There are some plateaus being reached here which anyone who intends to purchase an assembled terminal (in quantity of one) should be aware of. Antennas are approaching (at $750/$850) a practical minimum. Receivers can be expected, we feel, to drop down to perhaps the $1400/$1500 region (wired and tested) before the year is out. LNAs will similarly drop to at least the $750 region in the same time span. This re-adds then to a basic three-part package in the $3000 region by year's end. And there are of course some savings from these pricing levels possible when you go in as a dealer or distributor and begin talking about quantity buys of 25 or so per annum.

Meanwhile it is still possible to assemble your own terminal utilizing your own labor (perhaps 70-100 hours total) and buying component parts (and circuit boards from the numerous sources now offering same) for approximately $1,000.

FLANGES AND ROTATION SYSTEM DESIGN NOTES

by
Lance Ginner
Los Altos, California

For those who have gotten into the private terminal reception area by acquiring one of the Stanford (Mill Cross) ten foot dishes with the button hook **WR-284** waveguide here are some observations based upon my own experience plus some measurements conducted independently. For those who may have acquired a surplus parabolic dish via routes other than the Stanford Mill Cross project disposal yard, the information contained here may help you better understand how to obtain peak operating performance from your surplus antenna.

I had the opportunity to evaluate a wide assortment of (DEXCEL) LNAs and homebrew amplifiers with my ten foot system. In preparation for these tests an electrical transition section was machined to provide for adapting the WR-284 feed output to the smaller WR-229 flanged LNA input. (WR-284 covers 2.6 to 3.95 GHz while the WR-229 hardware covers 3.3 to 4.9 GHz; see page **T8** for November 1979 **CSD**.) During the tests, which were conducted with Taylor Howard of Stanford plus Yozo Satoda, Art Kawai and Ken Wong from DEXCEL in attendance, several satellites and various transponder channels were observed. For LNA comparison tests and tests of various LNA mounting techniques transponders were chosen which were at or slightly below the FM threshold of the receiver thus insuring that even small signal level differences would be apparent. The mechanical/electrical adapter shown in **figure one** was bolted to the WR-284 feed flange. Various DEXCEL LNAs were evaluated, each being bolted to the flange plate in the testbook fashion by **tightly** securing a bolt through **each** of the mounting plate/flange holes. During this mounting and unmounting of many LNAs it quickly became apparent that equally good results could be obtained by simply **holding** the LNA to the plate with one's hand, and, we discovered that one could **separate** the LNA flange plate from the WR-284 adapter flange plate by **as much as 1/2 inch** without noticeable signal degradation!

This was then taken one step further and the carefully constructed adapter (see figure one) was taken **off** of the antenna and the LNA flange was held against the feed flange on the button hook antenna. At this point it because apparent that the precision adapter flange contributed nothing to picture quality! In fact the mis-matched flanges could be rotated up to 1/4 inch in either direction (from being in line with one another) and there was no noticeable picture degradation. The end result of all of this testing was that a transition section from WR-284 to WR-229 perhaps is **not required** at all and any method that can be created to physically mount the LNA to the feed output is probably acceptable. For those who simply feel better having a nicely machined adapter, see figure one.

Several non-waveguide bi-polar and GaAs-FET amplifiers were placed on the antenna system utilizing the WR-284 to type N adapter furnished with this particular antenna. We encountered no problems with any of these various configurations including elimination of the input circulator.

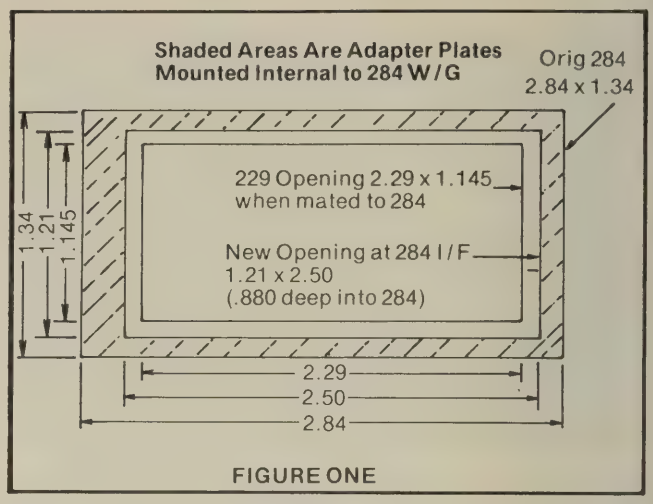
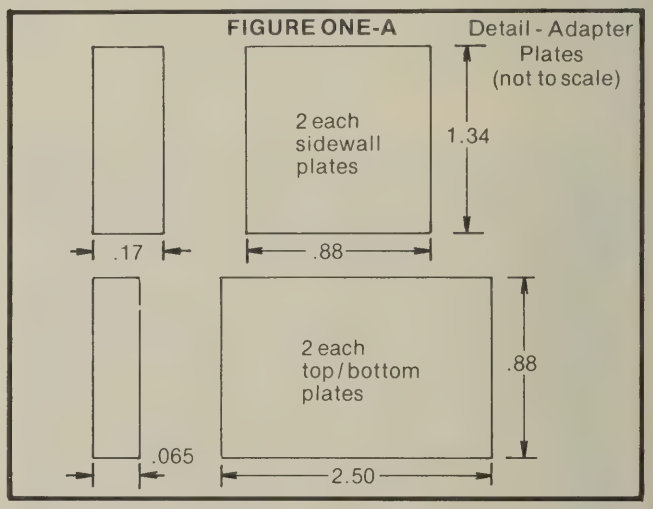


FIGURE ONE



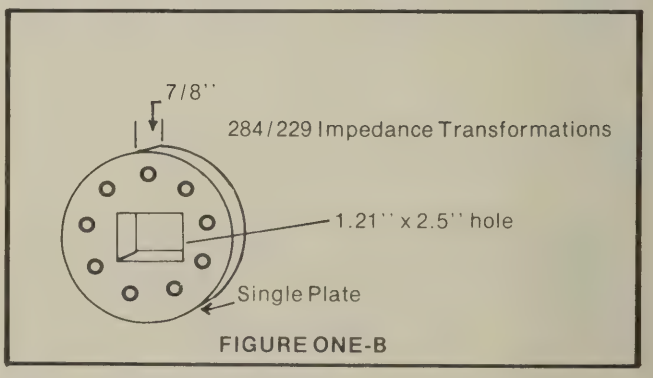


FIGURE ONE-B

One of the problems presented by any button hook antenna feed is rotation for changing from horizontal to vertical (or vice versa) polarized signals on SATCOM birds. **Figure two** shows a scheme I have worked out to accomplish this with this particular ten foot antenna and feed. It is likely that the same technique will function with virtually any button hook fed antenna. Note that you remove the aluminum ring mounted on the antenna's surface and machine it as shown in figure two. The polar axis drive requires about 20 turns per degree. A 100 RPM motor results in five degrees per minute which is slow (since satellites are 4 degrees or further apart) while 1000 RPM is simply too fast to stop accurately on each satellite. Within this range however one can often find surplus motors that will do the job very inexpensively.

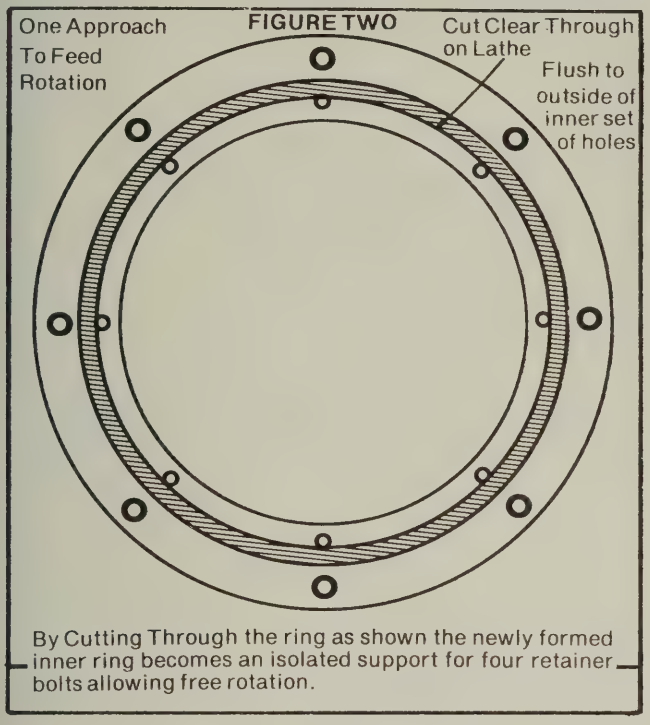
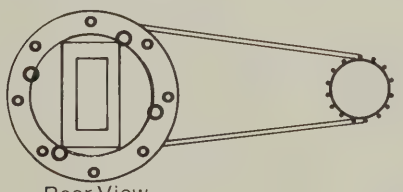


FIGURE TWO

By Cutting Through the ring as shown the newly formed inner ring becomes an isolated support for four retainer bolts allowing free rotation.

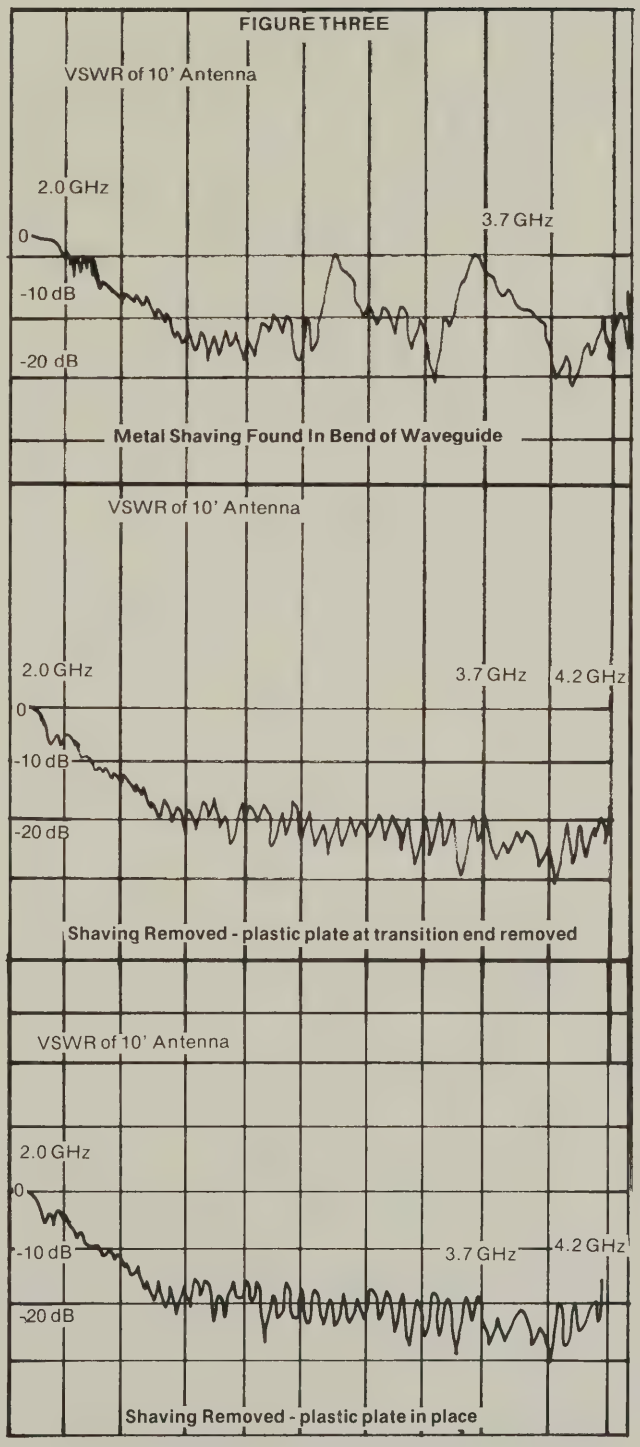
Use Bolt From Backside (4 each) with large washer. Lubricate with water-proof grease and adjust for loose fit - feed can be rotated easily with a TV rotor

Mount a Large Bicycle drive sprocket to the inner assembly and use a bicycle chain drive to a small sprocket attached to a TV rotor



Rear View

FIGURE TWO-B



I also had the opportunity with the cooperation and assistance of Hans Jekat at Hewlett Packard to place the feed **and the adapter** (see figure one) on a test bench and measure the match or return loss of the system. See **figure three**. Note that the bottom display shows the VSWR to be 1.2 to 1 or less (return loss 20 dB or better) over the frequency range of interest; 3.7 to 4.2 GHz. HP's Jekat found the VSWR to be almost infinite at several frequencies when he **first** checked the system (see figure three, top display). The problem was traced to a very fine piece of aluminum shaving, horsehair like in size, which had lodged inside the waveguide bend. This suggests that any feed you acquire, especially if surplus, should be 'cleaned' by dragging some rags or wadding through it several times to insure that something is not lodged inside.

In many of the feeds you will find a small plastic plate (sometimes loose) glued to the wall inside. This plate is intended to be a phase delay correction plate and as noted in figure three, middle and bottom VSWR plots, it has no effect on the VSWR and can be left in place or removed as you wish.

SATELLITE TV EXPERIMENTERS
INTRODUCING A COMPLETE
3.7 — 4.2 GHz DOWNCONVERTER
•3.7-4.2 GHz in... MHz out
•Remote, one ... tuning
•Dual conve... le
•Assembl... nly $895.

Polar M... Feed Rotation
...ish.
SU... paid

EXPERI... PLIES
•Teflon PC Boa... t 2.55
1/16''x9''x3'' (a...
1/32''x9''x4'' (ap...
•Chip capacitor kit ... 27, 39, 220, 4700 pf... or...
•SMA and microwave c...
•2''x14'' copper tube for ... khill feed, 3 lbs. $12.00
WRITE - We are adding to our inventory!
SATELLITE INNOVATIONS
P. O. Box 5673
Winston Salem, N.C. 27103
Add $2.00 shipping and handling (except for plans)

THIS PRODUCT NO LONGER AVAILABLE

SATELLITE TV RECEPTION MADE EASIER!

For those who are working with the Coleman or Howard TVRO system Manuals, here is a selection of PC boards, k... or assembled units which will get you 'up' and 'o... air' much sooner!

The fol... rds piggy-back to the popular Colem... fier boards to provide you with regu... for the important low noise amp...

	Board Only	Kit	Wired/Tested
	$2.00	$7.00	$15.00
CD...	...0	$6.00	$10.00

To rec... e a pair of systems designe... MHz tuning for subcarrie... d tested, specify subcarrier... e mount for easy 'stackin...

Model	Wired/Tested
SAA-1 (LM3065)	$18.00
SAA-2 (LM2808 with 2 watts audio)	...00

If you are fighting the... MHz IF system **with** a built-in ... **plus** a channel 3 RF remodulator, here's your answer! To add audio, order one or more SAA boards.

Model	PC Board Only	Kit	Wired/Tested
70HIF	$10.00	$60.00	$118.00

All boards are supplied with complete data and all boards are designed around the popular circuits found in the coleman and Howard TVRO manuals.

For more information contact **ROHNER MACHINE WORKS, INC**
John P. Rohner / Seventh & Elm Streets
West Liberty, Iowa 52776 (319-627-2510)

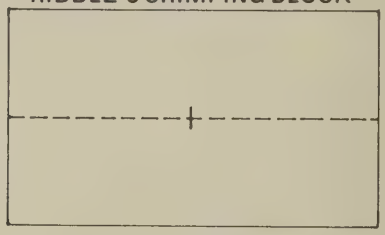
THIS PRODUCT NO LONGER AVAILABLE

THE COMPONENTS SCENE

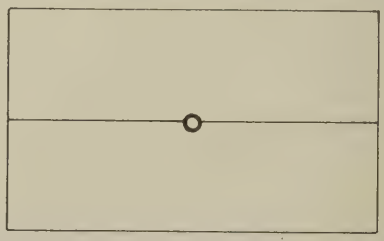
To many participants in the TVRO game the small SMA connectors utilized for piping around gig-a-hertz energy are at best baffling (although they appear to be quite simple in design at first glance). Proper outfitting of the SMA fittings to your 174/U or other .141 diameter coaxial cable is very important since these fittings and cable can potentially lose you several important dB of signal if not properly handled.

We are indebted to Lindsey Riddle of New Orleans for digging up and supplying the instructions you see here for installing crimp-type SMA fittings on cable. Lindsey also worked out the simple system shown for crimping the connectors onto the solid-sheath cable noting that the crimping tool widely sold for such applications carries a list price in the $140 region!

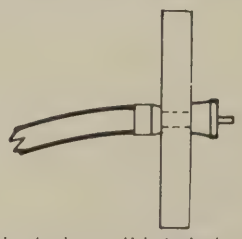
RIDDLE'S CRIMPING BLOCK



Using 1/4'' thick aluminum, cut block 2'' wide by 1.5'' high. Scribe line across middle and mark center.

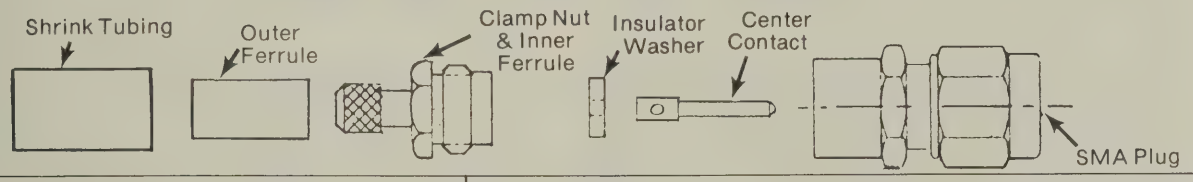


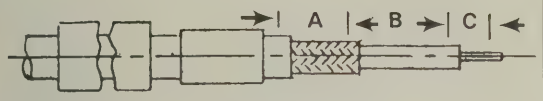
Drill hole (#35 drill or appropriate size) for RG174/U (or other) cable; cut across to separate halves.



Place connector to be 'crimped' into hole on bottom half and replace top half as shown. Whack with a hammer to 'crimp' the ring.

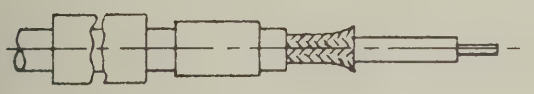
ASSEMBLY PROCEDURE FOR CRIMP TYPE SMA CONN. CABLE ACCOMODATION
RG-188A/U,-316/U,-174/U,-179B/U & -187A/U



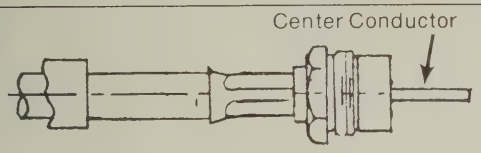


Connector	A	B	C
901-9601-3	.270	.230	.120
901-9601-3SF	.270	.230	.120

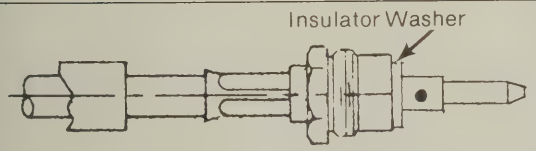
Slide heat shrink tubing and outer ferrule onto cable. Strip cable jacket, braid and dielectric to dimensions shown. All cuts are to be sharp and square. Important: Do not nick braid, dielectric or center conductor when cutting. Tin center conductor. Avoid excessive heat to prevent swelling of cable dielectric.



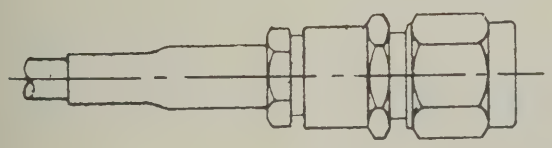
Flare end of cable braid slightly as shown to facilitate insertion onto inner ferrule.
Important: Do not comb out braid.



Slide clamp nut and inner ferrule under braid until cable dielectric is flush with front of inner ferrule. Slide outer ferrule in place and crimp with Amphenol tool No 227-944 and die set 227-1221-03 cavity "A" (M22520/5-03 Closure A.)



Place insulator washer on cable center conductor and bottom against inner ferrule body. Contact must butt firmly against insulator washer while soldering.



Screw ferrule-contact assembly into body and tighten to 20-25 in./lbs. torque. Slide heat shrink tubing over ferrule, up against clamp nut and shrink by applying heat.

THE WORLD ABOVE 10 GHz

by
Robert M. Richardson
Richcraft Engineering Ltd.
Drawer 1065
Chautauqua, N.Y. 14722
[716]753-2654

SUMMARY

Last month's episode described how ridiculously simple it is to build a proportional temperature control sub-system for the 10 GHz Gunnplexer that will maintain a constant 120 degree F temperature for the GPX (Gunnplexer) module over the range of -20 to +85 degrees ambient within a suitable weatherproof balsa wood enclosure. A simple electronic thermometer consisting of only an open base transistor and 1 milliamp ammeter was also described.

SPECIAL MARCH FEATURE

How about a crystal-controlled weak signal source for both 4 GHz and 10 GHz that may be built for less than $50? That may be frequency **or** amplitude modulated? That will allow you to put your 4 GHz or 10 GHz receiver **exactly** on the frequency you wish? That will allow you to **align** your 4 GHz or 10 GHz parabolic antenna to an azimuth heading within a fraction of a degree you wish? That will allow you to "**phase-lock**" your 4 GHz or 10 GHz oscillator to a temperature stabilized crystal-controlled source? Sounds impossible for less than

$50? No...it is not. As a matter of fact it is incredibly easy to do.

A VERY SMALL BIT OF THEORY AND PRACTICE

Every non-linear device generates harmonics. Among the most common non-linear devices are class "C" amplifiers. Among the cheapest microwave non-linear devices are crystal diodes; i.e., a package of 200 point-contact germanium diodes for about $2 from Poly Paks. If we combine a crystal oscillator and a number of class "C" transistor multipliers/amplifiers (for instance in the $39.95 price class VHF Engineering TX-432 transmitter) with a highly efficient microwave diode multiplier/antenna we have ingeniously created a crystal controlled microwave power source that will do all sorts of good things. Believe it or not, the little TX-432 transmitter and 1 cent diode multiplier/antenna shown in **figure 2** has actually transmitted a signal 1-1/2 miles across Lake Chautauqua (NY) on 10,152 MHz! This is the 22nd harmonic of the TX-432's 461.450 MHz output which is not exactly an overwhelming signal level at 10 GHz. The truth of the matter is that we used very "high class" 25 inch diameter parabolic reflector antennas ($7 each Snosled dishes) at each end of the circuit and relatively narrowband (about 5 kHz) FM deviation. So much for theory and practice. Now let us build one of these gizmos.

VHF ENGINEERING TX-432 1 WATT FM TRANSMITTER

This little 5 transistor plus one integrated circuit engineering marvel of a kit may be constructed and tuned in 1 or 2 evenings at most. Instructions (from the manufacturer) are clear and explicit. Output is at 24 times crystal frequency in the 420 to 470 MHz range. Since this is a satellite journal, let's assume we wish to build a crystal-controlled weak signal source with output on **exactly** 4.0 GHz, near the middle of the band (3.7 to 4.2 GHz). As such we would order a crystal for the TX-432 at exactly 18.5185 MHz. Crystal specs to order are: fundamental cut, ground parallel at 20 pF, .005% tolerance at 18.5185 MHz. The crystal (at $5 to $7) is the single most expensive item in the entire system if you already have a tripod. Now let's see how we get to 4.0 GHz.

Although the crystal oscillates on its fundamental frequency and may be heard in a general coverage receiver at 18.5185 MHz, the transistor oscillator output is on the 3rd harmonic at about 55.5555 MHz. The next three transistors are class C frequency doublers and drive an output transistor at exactly 444.444 MHz as a straight through class C amplifier. Inspite of this stage's 444.444 MHz output tuning/matching network, the strength of the harmonics are a joy to behold. The author built a 900 MHz output TX-432 a few years back for a passive microwave anti-shoplifting system he invented and the 900 MHz output was almost as strong (within a few dB) as a straight amplifier. Do not believe everything that is printed about the efficiency of frequency multipliers as the majority of them are **wrong**. The message here is: "build it, test it, and measure everything yourself," before accepting **anything** as sacrosanct gospel except I = E/R...and sometimes even Ohm's Law may be misleading.

FIGURE ONE - Multiplier, injection antenna beneath styrofoam cup.

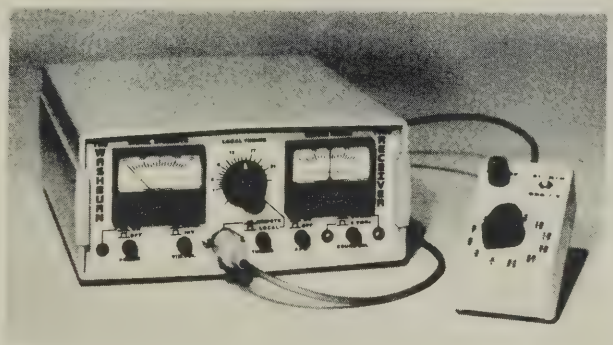
The little TX-432 even includes an FM integrated circuit configured to perform high impedance microphone pre-

FIGURE TWO - TX-432 transmitter, multiplier, horn antenna.

THE WASHBURN TVRO RECEIVER

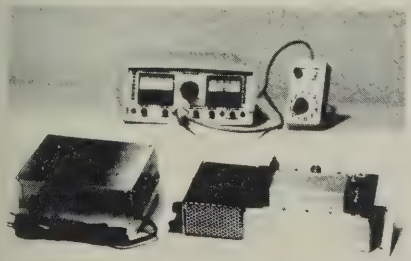
The WASHBURN TVRO RECEIVER is a complete, high performance unit which provides excellent quality picture and sound reception from television satellites. The easy to operate format makes the WASHBURN receiver ideal for any application where non-technical users are encountered, such as the home, job site or resort. Advanced state-of-the-art, technical features such as; extended threshold demodualtion, full band width video and wide range AFC insure professional quality performance for years to come.

The WASHBURN, receiver of the 80's!



STANDARD FEATURES:

- ***EXTENDED THRESHOLD***. . .a state of the art approach to threshold extension that allows sparklie-free reception of program material with CNRs of 8 dB and above, achieved with-**out** compromises in IF bandwidth or video bandwidth and with special design attention to maintaining video phase and amplitude linearity as one would expect to find in a high dollar commercial receiver package.
- ***LOW DISTORTION AUDIO***. . .a unique approach to recovering **all** of the audio bandwidth present on the satellite transmission utilizing a true low-distortion, low-noise, high fidelity audio output with remote control and **automatic** selection of either the 6.2 or 6.8 MHz sound subcarriers; with indicators to show which audio subcarriers are present and a priority selection system so that the presence of some other modulation format (such as slow scan video) on 6.2 MHz will not be selected for listening (but a **normal** audio modulated subcarrier on 6.2 MHz on a different transponder **will** be heard.) Additionally, CCITT (or ANIK) subcarrier frequencies different from the normal 6.2 and 6.8 MHz North American DOMSAT bids can also be received and deemphasis supplied by component value changes.
- ***HIGH PERFORMANCE AFC***. . .that works as well as the RCA home receiver Colortrak® system and provides a very high overall level of dispersion cancellation, eliminating any need for a complex and expensive frequency synthesis system.
- ***AUTOMATIC AND PRECISE***. . .feed rotation control using a readily available, modest-in-cost (TV) antenna rotor assembly.
- ***FULL FUNCTION METERING***. . .dual meters to show received signal carrier to noise ratio (CNR) and AFC center tuning. Meters calibrated directly in db and MHz.
- ***VTR COMPATIBLE INPUTS AND OUTPUTS***. . .to provide easy back-feeding of a home (or neighborhood) MATV system, plus simple off-bird-recording without additional switching or complex cabling.
- ***PROFESSIONALLY DESIGNED AND MANUFACTURED***. . .utilizing an out-of-the-way down-converter (mounting separate from the demodulator proper) with an LNA power supply, a feed rotation system (to allow operational remote control of the feed point antenna for separate reception of vertically and horizontally polarized transponders), a small demodulator console with full provisions for constant monitoring of the system performance, and, a hand-held remote control that allows the viewer to adjust the system to each of the 24 channels found on SATCOM birds (or alternately 12 or ANIK, WESTAR birds) with a remote control. This design allows operation by a non-technical viewer without the requirement for special instructions.



WASHBURN RECEIVER, *fully aligned with one year parts and labor warranty*..... **$2995.00**

WASHBURN RECEIVER, *kit form, 90 day parts only warranty, less rotor motor* **$1495.00**

ramsey electronics **BOX 4072 ROCHESTER, NY 14610 (716) 271-6487**

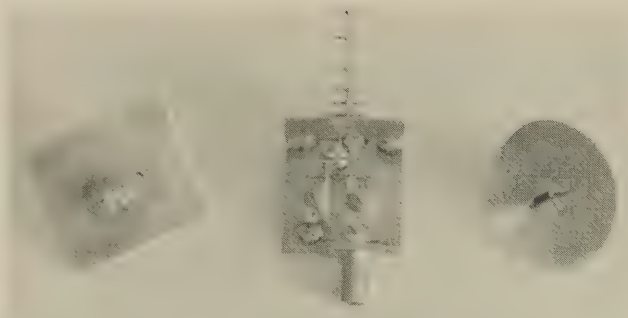


FIGURE THREE - experimental 10 GHz multipliers, antenna

FIGURE FOUR - 10 GHz horn/multiplier on dish

emphasis and audio amplification. A variable resistor sets the level of deviation by varying the amount of audio voltage presented to a varactor which FM's (or PM's - your choice) the crystal. You can imagine what an incredibly small amount of modulation is required for 5 kHz deviation at the TX-432's output **times** 22 for 10 GHz. Additionally, a capacitor may be used to "bend" the crystal's frequency within reasonable limits to the frequency that you desire. Even a cheapy Heathkit counter is more than adequate for the majority of applications when measured at the fundamental frequency or better yet at the 3rd or 6th harmonic to prevent loading the crystal and associated circuitry.

If you could look at figure 2 with a magnifying glass you can see the 3/4" square balsawood housing around the crystal. What does it do? Why it PTC's (proportional temperature controls) the crystal just like **CSD**'s World Above 10 GHz described in the February '80 issue. The only significant difference is that it utilizes a 1 cent "leaky" germanium Poly Paks diode for the temperature sensor instead of an expensive 99 cent open base germanium transistor. Since the heat radiating area is many orders of magnitude smaller than the Gunnplexer module, the heating requirements to maintain the crystal at a constant 120 degree F (plus or minus 1/100th of a degree F) are minimal and average 5 to 10 milliamps in the +50 to +75 degree F ambient range. In the 10 GHz band we are using the crystal's **528th harmonic** and for 4.0 GHz output we are using the crystal's (24 x 11) **216th harmonic**; hence it is obvious why we must temperature stabilize the crystal if we desire laboratory standard frequency calibration accuracy or if we choose to phase-lock our 4 GHz or 10 GHz oscillator to it. For short-term measurements the proportional temperature control may be ignored **if** we have an accurate digital frequency counter reading the TX-432 crystal's 6th harmonic at 111.111 MHz across a resistor (R6) on the input to the doubler transistor (Q3). For brevity' sake, we rounded off the crystal's actual frequency of 18.51851852 to 18.5185 MHz. The aforementioned trimmer (C30) will allow you to adjust **exactly** on frequency if you are patient.

For those intrepid TV satellite hunters without access to lab standard test equipment, **don't** worry and fret. A .005% tolerance crystal from a reputable crystal grinder like JAN Crystals, Inc. (located in Ft. Myers, Florida) will put your receiver more than close enough to 4.0 GHz for most practical purposes.

FREQUENCY MULTIPLIER/HORN ANTENNA CIRCUIT

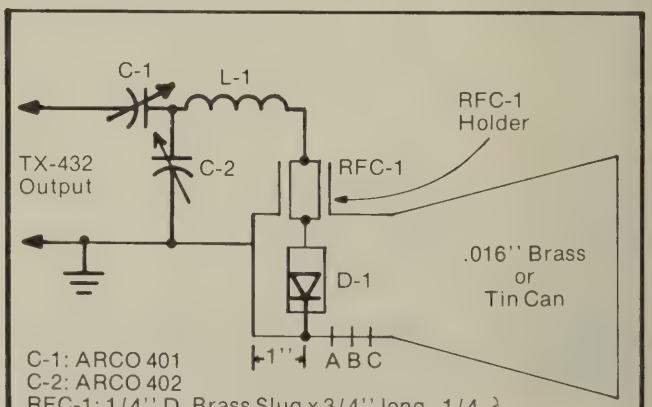
Figure 5 illustrates this circuit. Its job is three fold:

1) To match the 50 Ohm input impedance from the local or remote TX-432 444.4444 MHz signal to the optimum impedance the crystal diode wants to see to generate the maximum harmonic energy for a given power input.
2) Provide a very modest "Q" environment for the crystal multiplier so that harmonics other than the desired 9th harmonic are somewhat attenuated...not much, but some.
3) Provide a reasonably efficient waveguide to horn antenna with a beamwidth on the order of 50 to 60 degrees between 3 dB down points.

Somewhat surprisingly, this uniquely simple circuit accomplishes all 3 jobs quite well. It yields an SWR of 1.1 to 1.5 when properly tuned and measured with a Bird Thruline Wattmeter (using a 1 watt 400 to 1000 MHz slug), inserted between the TX-432 and multiplier/antenna assembly.

CONSTRUCTING THE 4.0 GHZ MULTIPLIER/ANTENNA ASSEMBLY

If you were in a professional microwave laboratory you would undoubtedly use heavy gauge brass sheet with triple silver plating after the assembly was completed. Since you are most probably located on a remote Montana sheep ranch at least 150 miles from nowhere and do not have a plating shop down the hall we will skip the silver plating bit and maybe even make the waveguide/antenna assembly from tin cans rolled flat if you do not have a ready supply of .016" thick (or up) sheet brass. Will it make a **giant** difference? In all actuality, the answer is **no** it will not. Except with rather sophisticated test equipment, you will not be able to even measure the difference in efficiency between the tin can and silver plated brass waveguide/horn antenna assemblies **unless** you allow it to lie out in the rain and rust, or use it as an alternate boat anchor in an acidic pond. Another pleasant surprise, we hope. For those who wish to dig deeper into the subject of silver plated brass versus tin can cavity construction, we suggest you read the article in the April 1978 issue of **'73 Magazine**, "How to Succeed On 1296 MHz," (pages 32 to 35) by the author. In this case a 1296 MHz cavity amplifier was constructed using a "cat foot" tin can for the 25 watt cavity amplifier. There was no measurable difference in efficiency between amplifiers constructed from silver plated brass and those made from cat food cans. The "key word" here is of course, "measurable."



C-1: ARCO 401
C-2: ARCO 402
RFC-1: 1/4" D. Brass Slug x 3/4" long - 1/4 λ
L-1: 2 Turns #16 1/4" ID x 1/2" long.
D-1: 1N21D or Poly Paks Point - Contact Germanium
RFC-1 Holder: 5/16" ID Brass Tube x 3/4" long.
NOTE: Wrap RFC-1 with scotch tape for press fit.

FIGURE FIVE

Naturally there is a difference. It is just that it is an "insignificant" difference. Regardless of what you choose to build your waveguide/horn antenna assembly from, it **must** be flat. Lay out the pattern with a scribe using the dimensions given in **figure 6**. If you do not have a sheet metal brake, simply bend-up the waveguide assembly in a vise using a few scraps of white pine for shims and beat it into shape with a hammer. None of the dimensions are particularly critical, but try to hold the **accuracy** to within about **1/16 inch** if you want top performance. Use at least a 50 watt Ungar soldering pencil or larger iron for soldering the cavity and horn antenna segments together with lots of "Nokorode" sodering paste to assure perfect joints. When everything is soldered together, use a fine-grain flat bastard file (no offense intended) to smooth **all** internal and external joints. As the 4.0 GHz waveguide/horn antenna assembly is considerably larger than the 10 GHz system shown in figure 2, we suggest you mount the TX-432 **and** the multiplier/horn antenna assembly on a 3 inch wide sheet of double tempered 1/4" thick masonite about 12" long. The masonite sheet would then be attached to your camera tripod or whatever you choose to mount the assembly upon. The tripod is convenient and easy to adjust.

FINAL TUNE-UP AND TEST

We find a small 12 volt 10 amp hour capacity motorcycle storage battery will run the complete system for hours on end and is light enough to make the system truly portable. Total system current drain is less than 1 amp.

For those big spenders who do not wish the pleasure of sorting through a bag of 200 Poly Pak point-contact germanium diodes for $2.00, we suggest you substitute 1N21D diodes (available from G & G Electronics in NYC) for about $3. All the 1N21D diodes tested so far put out a booming signal on the crystal's 528th harmonic in the 10 GHz band and will literally "blow your mixer's mind" at 4.0 GHz with an extremely strong signal. So strong in fact, we recommend you remove your 4.0 GHz RF amplifier stage for close-in tests or mis-align the antenna.

After the TX-432 is tuned up at 444.4444 MHz following the instructions that come with the kit, (**they** mean #47 pilot light bulb instead of #12), beg, borrow or steal an SWR bridge or Thruline Wattmeter from a nearby 2-way radio shop that will work properly in the 3/4 meter (432 MHz) ham band. Plug it in between the TX-432 and your neatly constructed multiplier/horn antenna. The only tuning necessary is to adjust the (schematic indicated) multiplier's (C2 and C3) trimmer capacitors for minimum SWR reading. They will interact somewhat, but with patience you should be able to get the forward SWR down to the 1.1 to 1.5 ballpark. At this point we strongly suggest you reduce the TX-432's 444.4444 MHz power output to **less than** 1/2 watt by inserting a 5 or 10 ohm 1/2 watt resistor in place of (schematic indicated) R11.

Now, move the assembly, battery and all, about 50 feet away from your 4 GHz antenna. Both antennas should be pointing at each other. Tune the 4 GHz receiver's local oscillator to whatever the specs call for to receive 4 GHz. "Swish it about a bit," and **there** is your weak signal source about 40 dB over S-9 plus. That's all there is to it. If you have an S-meter on the 4 GHz receiver, by all means peak-up **all** the TX-432 stages and multiplier for maximum output.

NEXT MONTH

We will cover using the North star, Polaris, and a homebrew transit made from a camera tripod to align your 4 GHz antenna on whatever TV satellite you wish...using of course, the 4 GHz crystal-controlled weak signal source we built this month for final alignment.

APPENDIX

Poly Paks, P. O. Box 942, South Lynnfield, MA 01940
VHF Engineering, 1783 W. 32nd Place, Hialeah, FL 33012 (305-887-3203)
G&G Electronics, 45-47 Warren St., New York, NY 10007

RICHCRAFT ENGINEERING LTD.

...offers you a computer generated printout for antenna azimuth and elevation pointing from your receiving site to all major geostationary satellites capable of being received in North America. This provides you with a basis for locating the following satellites: SATCOM F1, F2, and, WESTAR I, II and III, and, COMSTAR I, II and III, and, ANIK III and B, and, Ghorizont, and, STATSIONAR 4. Provide them with your geographic coordinates (longitude and latitude to within 10 minutes, taken from Road Atlas if no other source is available) plus $5.00 to handle shipping and handling and write to Richcraft Engineering Ltd., Drawer 1065, Chautauqua, New York 14722 (716-753-2654).

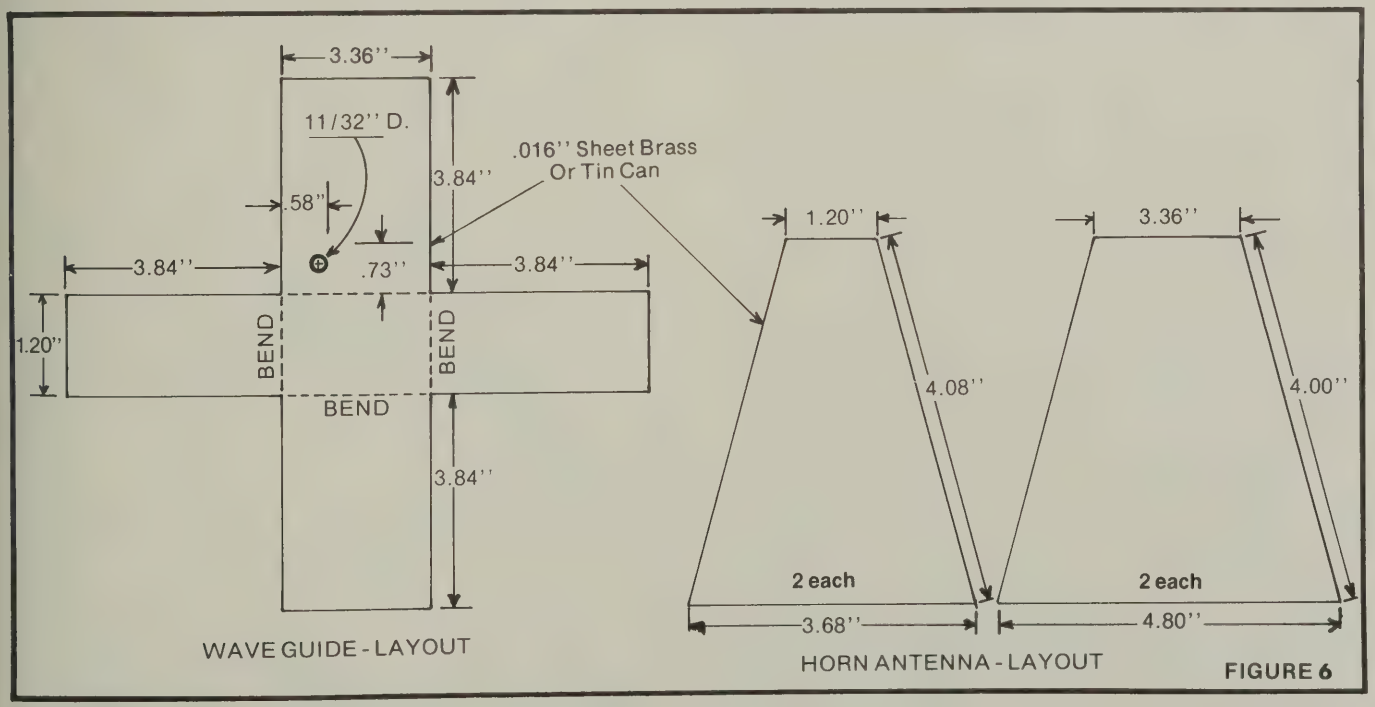


FIGURE 6

TECHNICAL NEWS NOTES

COMSAT LABS planning to demonstrate a five meter (27 feet wide by 16 feet high) TORUS antenna to cable operators in May in Dallas. Price to be in $30,000 range. TORUS is similar to Swan Spherical but this particular version can only scan 20 degrees of orbit belt. With FI at 135 degrees and FII at 119 degrees that is adequate for present cable uses.

OAK COMMUNICATIONS has conducted tests of new satellite scrambling system with assistance of Western Union utilizing WU's Lake Geneva, Wisconsin uplink site. Nobody wants to talk about the system, what it costs or on what principle it works; only stating "tests were successful". Oak is substantial supplier of cable security systems for pay cable and primary supplier of STV scrambler systems for over the air pay.

Harris Communications is expected to announce full line of small aperture receive terminals shortly with early marketing interest directed at small audio-only receive terminals. Don't be surprised if they also pop up in video field.

Russians have launched 46th Molniya satellite with typical 62.8 degree inclined orbit, 40,830 apogee and 478 perigee in a 12 hour and 17 minute cycle. During 1979 Russians launched 86 satellites (roughly one every four days!) while U.S. managed to get 15 off the ground.

RCA has not given up with two-for-one video system which compresses a pair of video signals into a single transponder. Several techniques for jamming two or even three (if digital) video signals into common 36 MHz transponder have been developed through years; all to date suffer from 3 to 5 dB system performance degradation over single fully-modulated video signal through transponder.

While AP predicts they will have 1600 audio only receive terminals in operation by end of 1980 National Public Radio 4.5 meter audio-only system is running behind contract schedule through supplier Collins/Rockwell. Problems with uplink transmitters, below threshold signal levels in Alaska, lack of backup equipment have been cited.

Marriage of development of DOMSAT for TV/audio/data and local TV outlets is latest plan from China. Chinese now say they plan 'tens of thousands' of receiving sites each equipped with typically 50 watt and 150 foot elevated VHF transmitter to cover local area perhaps 5-10 miles radius. Chinese also saying they prefer the 12 GHz band for this service although many US suppliers still believe an 'interim' 4 GHz system, possibly utilizing off-shelf Hughes satellite, will come first. One report suggests orbit spot for Chinese bird will be 92° east.

UPI now sees 'as many as 3,700' terminals in 6 to 10 foot class for radio stations, television stations and newspapers. Audio/data terminals being bought from Farinon/Harris ranging from $4,200 to $8,200 each. First installations scheduled this July.

Latest shuttle forecast; first flight no sooner than November; probably will be early in 1981. Tiles are still major problem.

Southern Pacific Communications wants to launch two C band satellites of own but US has run out of orbit spots if FCC grants Hughes permission to launch (see **CSD** February). FCC undecided how to handle excess of requests for last US domestic orbit spots (75 and 79 degrees west); agency feels it may have to seriously consider reducing orbit spacings to 3 degrees from present 4-5.

BIRKILL CATJ CORRECTION

Steve Birkill, who continues to provide a satellite technology column to **CATJ** magazine (which Coop started in 1974), suffered an unfortunate mixup in schematic-component layout drawing in the December issue of **CATJ**. The circuit describes a single stage GAT-5 (Plessey) 1.5 dB noise figure range LNA developed by Birkill and supported by a circuit board which his Real-World Technology makes available.

The diagram (3) appearing on page 50 of **CATJ** for December shows a pair of holes in the circuit board through which gate and drain bias is brought to the GAT-5 device. Birkill warns that the diagram was incorrectly reproduced by **CATJ**; that the hole nomenclatured at the bottom of the diagram as carrying drain bias from "C5,D2 and M1..." should actually read "**carrying gate bias [variable] from C4, D1 and RV1**". Similarly the **CATJ** nomenclature to the lower right that calls for (a hole carrying) "gate bias (variable) from C4, D1 and RV1..." should actually read "**carrying drain bias + 5V from C5, D2 and M1...**". As Steve warns failure to provide the proper bias to the proper points on the GAT-5 could easily destroy a (U.S. priced) $225 transistor in one unpleasant puff.

As noted Birkill's RWT does have a quality circuit board for this first-LNA-stage and with each circuit board is a correct set of instructions for construction and use of the LNA. Plessey devices remain quite expensive in the USA although there have been some indications of late that they may become more competitive shortly.

GENUINE HOWARD TERMINAL PC CARDS

Bob Coleman and Tay Howard are now producing four PC cards which make duplication of the Howard Terminal (latest version) system a snap!

(A) Dual Conversion (4 GHz to 70 MHz) - $25.00
(B) 70 MHz IF and Filter - $25.00
(C) Howard Demodulator - $40.00
(D) Dual Audio + AFC - $25.00

These proven and tested high quality boards are available as a four-board-package for $99 including complete documentation and a list of distributors stocking parts. Parts kits also available from DACOR.

Order from: Robert M. Coleman, Rte. 3, Box 58-A
Travelers Rest, S.C. 29690

FOR YOUR EARTH STATION, CHOOSE

AVCOM'S PSR-3

SATELLITE VIDEO RECEIVER

DESIGNED FOR YOUR PRIVATE TERMINAL

- Remote tuning
- Dual video outputs
- Exclusive Clamp-Sync & Scan-Tune
- Many other features!

AVCOM of Virginia, Inc.
10139 Apache Road, Richmond, VA 23235
(804)320-4439

COOP'S COMMENT ON PROGRAMMING

BRINGING COMSAT'S BIRDS TO ROOST

On this page in February we raised the spectre of satellite-hype and in particular questioned the blantantly premature announcements by COMSAT and SEARS that the duo would be marketing home (11/12 GHz) satellite terminals "by 1983 or 4". Let's see where all of this smoke has led us in the intervening month.

COMSAT has been forecasting that they would 'hit the FCC' with a full blown description of their proposed direct broadcasting system around mid-March. They have engaged former FCC Chairman Richard Wiley, now in private law practice in Washington, to draft or supervise the FCC proposal. That sounds impressive.

But their announcements have begun to draw fire. Some of that fire is much more impressive than the smoke they have been wisping about. For example:

1) **The FCC has announced** they are immediately beginning internal research aimed at formulating an FCC 'white' or 'options' paper on the whole question of direct broadcasting satellites. Internal sources within the FCC say that any proposals submitted to them prior to the completion of that option paper will simply collect dust until the paper is done, and then after it is done, until a decision is made by the FCC on the direction the agency will allow direct satellite broadcasting to move. How long will this take? Well, they expect drafting the options paper to take nine months (or more) and then how long will a decision take after that? Assuming a Rule Making Proposal, time for public comment, and then finally a decision we'd not expect a formal FCC decision until at least 1982.
2) **House Communications Subcommittee Chairman** Lionel Van Deerlin has announced the wishes to hold formal hearings in March on the 'international and domestic activities of COMSAT'. Van Deerlin staffers note "COMSAT is a creature of Congress so Congress has a responsibility to check on it from time to time". What prompted this sudden decision to hold hearings on such short notice? "Direct broadcasting satellites (as proposed by COMSAT) are a vital interest of Congressman Van Deerlin...". COMSAT is attempting to get the hearings postponed.
3) **ITT, RCA and Western Union** have challenged a contract granted by the U.S. Defense Department to COMSAT for earth stations at military bases in Hawaii and on Guam. It is alleged that COMSAT used its monoply position (which was originally authorized by Congress in 1962) to win the contract.
4) **COMSAT**, meanwhile, **has announced it plans** to market a 5 meter TORUS antenna (that's the antenna that looks like a Swan Spherical) to CATV systems and word out is they plan to display it to the cable people in Dallas in May.
5) **The broadcasters**, represented through the powerful National Association of Broadcasters, are starting to act nervous over the COMSAT proposal. Said NAB spokesman Jack Harris recently "...(approval of) this system would likely be fatal to local station operation...".
6) **The NAB Board meanwhile** said late in January "(this COMSAT proposal) cannot be authorized by the FCC unless Congress first approves this...non-local transmission and determines the conditions...under which it can become operational. (Direct satellite TV) is inconsistent with the (established) system of local TV...provided by the 1934 Communications Act".
7) **The Corporation for Public Broadcasting** (CPB) which operates the PBS network approves of some of what COMSAT is proposing and hopes to benefit by being one of the services offered by COMSAT on a pay-to-view basis. Why is CPB interested? "Direct access to the home on a pay basis...holds some promise as one funding source for CPB (PBS)...".

Lots of smoke. But no fire yet. Former NTIA deputy director Paul Bortz, now a consultant in communication areas and still one of the best minds in the industry, sums it all up very nicely. States Paul "**COMSAT's predicted time frame** (1983-4) **is at best very unrealistic**". Bortz predicts, as do we, that the COMSAT proposal will be tied up in Congressional and regulatory agency hassles for years to come. At the very least the USA must await the outcome of the 1983 hemispheric conference on 12 GHz orbit slots (a continuation of WARC 79) before we even know how many 12 GHz orbit slots this nation will receive. More likely, it will be 1985 before that important determination is made. And Bortz notes "After that, the equipment will have to be funded, designed and built". Bortz suggests early 1990's for the start of such a system. We suggest he's much closer to the truth than Sears and Comsat with their 1983-4 time frame announcement.

What does all of this mean? Simply two things. COMSAT has a rough, long road ahead of it with this proposal. And the second? **For this decade at least** the present in-place 4 GHz 'C' band service will be with us as our dominant service.

CSD PROGRAMMING

COOP'S SATELLITE DIGEST (Programming Edition) is produced monthly by Satellite Television Technology, P.O. Box G, Arcadia, Oklahoma 73007 (405-396-2574). CSD is available in two separate editions (Programming and Technology) or as a combined subscription. Subscription rates are $30 per year for first class mail delivery within U.S.A. or Canada for either edition, or $50 per year for the combined editions. Outside U.S.A. or Canada add $25.00 per year for any subscription. All subscriptions to be paid in advance in U.S. funds drawn on a U.S. bank; no invoicing.
Contents are Copyright 1980 © by Statellite Television Technolgy and any duplication or reproduction in any form without written permission is a violation of Federal Statue (17 USC 101 et seq.).

IF THIS IS HIXON -

IT MUST BE TUESDAY

During the mid part of this past December a pair of the **Paraframe** ET/3.66 (12 foot) antennas were scheduled for shipment to dealers in Colorado and British Columbia. Like virtually everyone else in this market we are learning what is good and not so good about our products (and the products of others!) on a daily basis. The opportunity to 'go with' a pair of antennas to be on hand when they were installed was too good to pass up largely because the trip offered me an occasion to see whether we could be building the antennas differently at the Paraframe plant in Illinois so that they would go together better (i.e. easier) or perform better.

The first stop was to be Kamloops, British Columbia where Paige Lycett, owner of Kamloops Communications was going to install a TVRO for a small remote community in northern BC. After some advice from Paige we shipped the ET/3.66 to a warehouse Paige utilizes in Bellingham, Washington. Again following Paige's instructions I had prepared a set of custom declaration forms detailing the contents of the shipment; one-each $450 (value) 'Solar Heat Reflector' (!).

At the Seattle airport Chris Sivertz (Chief TVRO Field Engineer for Paige) met me and packed into Paige's GMC Motorhome we headed for Vancouver where we had to clear some SCI LNAs and receivers through Canadian customs. During this bureaucratic interlude I practiced talking "Western Canadian" with phrases like 'oot' for out and 'wee' for little and so on; ending a sentence with an 'ay' ever now and again to show that I spoke their lingo.

The ET/3.66 was destined for a community called Hixon, some 40 miles south of Prince George. A total of 300 people live in Hixon and they have been forced to be content with 1-1/2 channels of TV up to now. As Chris throttled the GMC Motorhome up the Trans Canada Highway in the Frazer River Canyon he explained: "**Back east they make laws that impede rather than aid progress out here where everything is spread out and you consider yourself lucky to get even 1-1/2 channels of TV. Heck, when we put up our 10 foot experimental TVRO antenna on our roof in Kamloops the local CBC boys even came over to help out!**".

Chris continued "**We do lots of 2-way radio business and TV too; terrestrial TV that is. Or it was until we immersed ourselves in the satellite TV scene!**".

Chris and I passed through mile after mile of awesome scenery with the tape deck playing the 24 hour disco which Chris had taped off of a subcarrier on transponder 21. I had never heard such vibrant disco with such creative energy. It was a perfect match for the enthusiasm and energy of these western Canadians!

Finally we arrived at Kamloops; 60,000 people spread out in a large valley, a magnificent nighttime view after hours of lumber camps and truck stops. I spent the night at Paige's home and it was an 'event'. Janet's excellent cooking, plenty of good wine and such conversations. At one point I proposed a 'toast' to the western portions of both Canada and the United States seceding from their respective nations to form a dynamic new union. Paige countered that the wealth of western Canada was under constant attack from the red tape/regulation-gone-wild of their federal government! Bottoms up and another round of drinks...'**ay!**

The next day we loaded the heavier parts of the ET/3.66 into a pickup, a four banger Toyota, that I would get a head start in. About five miles up the road (and 230 more to go) I discovered I had left the transponder 21 disco tapes behind. I checked the glove compartment; 'Twenty Favorite Songs to Dance To' with the Bob Campbell Band. Oh k-a-a-a-y...Turning north on BC Route 97 at Cache Creek and I was well on my way towards Hixon. Soon I hit mixed snow and sleet and I dropped the Toyota to 40 MPH. Promptly everything on the road began shooting by me...Kenworths hauling logs, 4 WD pickups, pickups without 4WD, TransAms and 'Vettes with straight pipes. And **everyone** had the big quartz-halogen driving lights fairly burning and blistering the paint off the rear of the Toyota.

Finally I arrived, pulled into Hixon and one of the Kamloops crew, Stan, pulled in behind me. I was promptly introduced to several of the town's citizens who had been instrumental in getting the TVRO funded and ordered. This is a most interesting community of 300; they do virtually everything as a 'family unit'. For example, nearly 85 couples from Hixon had chartered a flight to Hawaii in 1979. There is a real sense of community in everyone. Rolly Fuller, who runs an Imperial Esso station, was typical. He and his wife, Ethel, had left the suburban congestion of Vancouver to seek out a healthy rural environment to raise their sons.

The next day we put the ET/3.66 together in a quonset hut which one of the local residents utilizes

by
Jim Vines
Paraframe
Monee, Illinois

I THINK THIS STUFF IS FROZEN!The Canadians don't let a little thing like snow slow them down; they just adapt and charge ahead.

BOY WHAT FUN THIS IS! Pouring concrete in the middle of the Canadian night with snow on the ground for the ET/3.66 mount.

to maintain his Kenworth log hauler. I later learned he grosses $500 a day hauling logs with that rig. Everyone it seemed helped, from those who were making big money off the land to those who were there to teach the town's school children. At one time or another around two-thirds of Hixon's male population stopped by to lend a hand to the project. They all had one thing in common; they were frantic for lots of channels of clear TV and damn the federal bureaucrats who stood in their way and said they could not have it!

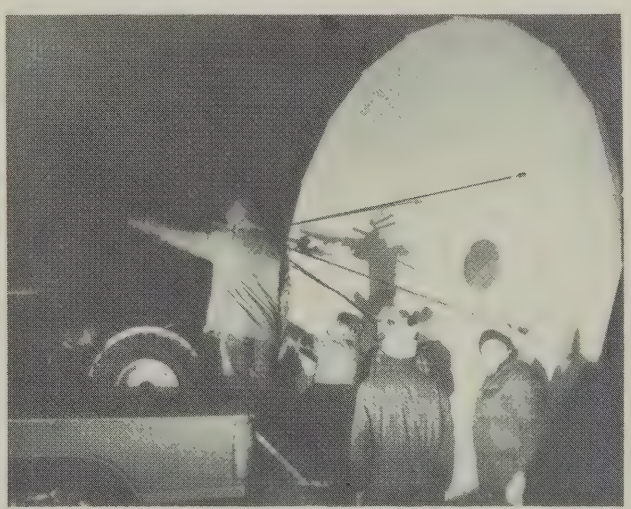
When the dish was completed we put it on a trailer and towed (as part of a long convoy of townspeople) three miles north on RT 97 and off down a side road. Then across a gully and into a pasture and onto the site where the town's TV translator 'connected' the homes to the outside world through a network of these old fashioned rebroadcasting devices. There was the el-az mounting waiting for the dish. The 4 WD's spaced out into a semicircle with their straight pipes rumbling and trained their headlights on the site. There we were on the side of a hill struggling mightily in Sunday's post-twilight to lift 600 pounds of antenna onto the mount. We did it, sweating and straining in the cold night air. On with the (SCI) LNA and the (Tony Bickel/ECA) feed. Check the distance from the throat to the feed and now aim for F1.

The monitor in the nearby Dodge Club Cab showed an image - almost **too** quickly. Also it was reversed in polarity; negative. Some more pointing and receiver fiddling and we had a beautiful noise-free picture. (In fact the C-N meter on the SCI receiver read 15!) Everyone gathered around with great glee and backslapping. Then it grew quiet with only an occasional awestruck utterance of the tremendous quality of the picture. Chris Sivertz was muttering too. ''That's **too strong** for F1...''.

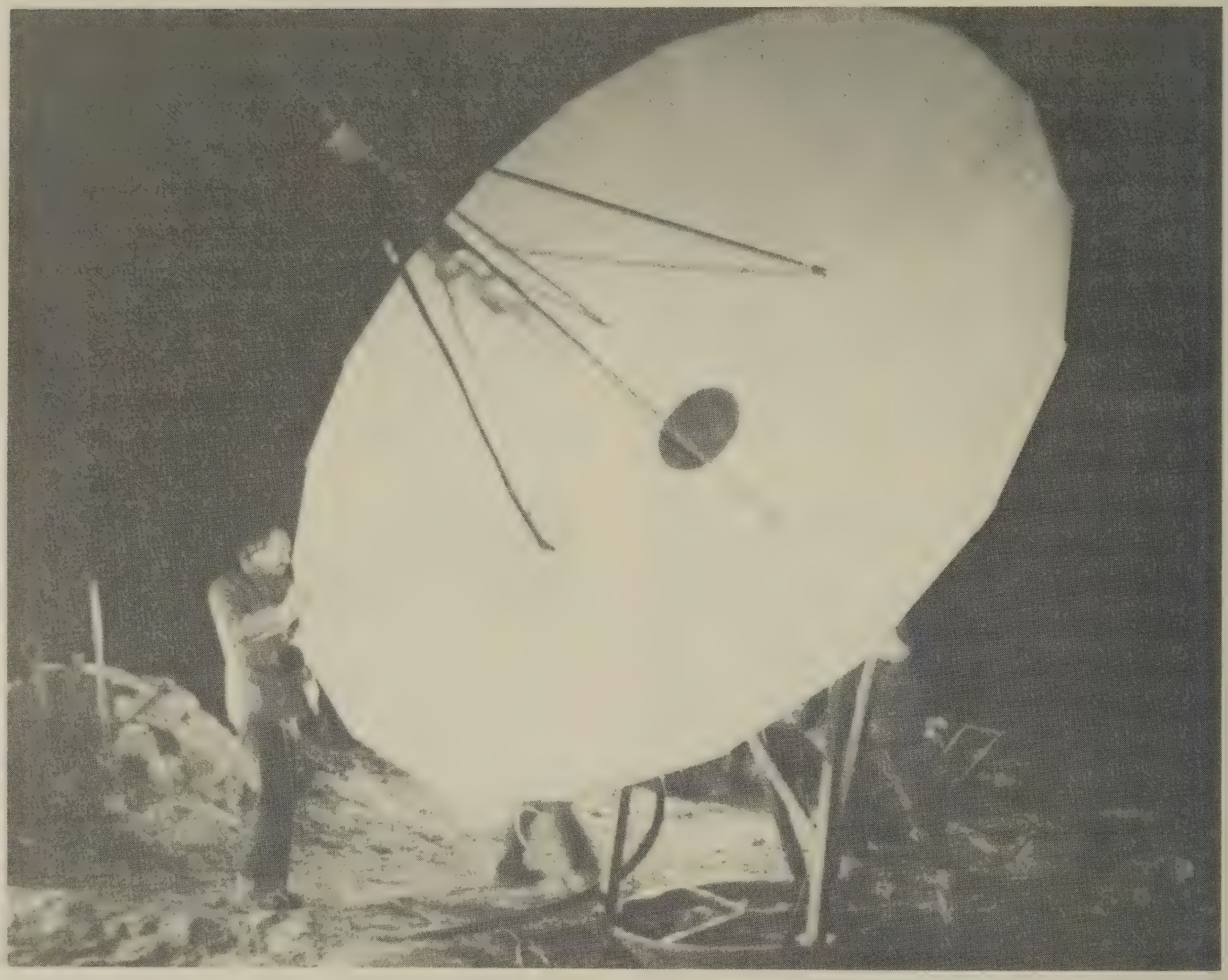
There was a break for a commercial. Odd...we kept watching and watching and then a transponder identification. ''**KING-TV, Seattle...**''.

Chris: ''That's BC Tel...we are right in the

ASSEMBLED IN A QUONSET HUT this dish could say. The citizens of Hixon volunteered their time to help the community to get its shot at high quality TV from satellite.



I TELL 'YA - F1's OVER THERE! Well, it may have been there alright but so was BC Tel's terrestrial link.



A SHINEY WHITE SHIELD IN THE CANADIAN NIGHT - ET/3.66 begins the aiming process under guidance of Max Lentz.

middle of their bloody terrestrial microwave path feeding a cable system!''. More aiming and more KING-TV. So we closed up and went back to town.

There were several possibilities...Paige Lycett would later plot them out in what seemed like logical order:

1)Erect an RF screen to shield the TVRO antenna,
2)Erect a small six foot dish to receive Seattle's KING off of the BC Tel terrestrial microwave link,
3)Move the TVRO site to some other location.

I mentioned to Paige that taking the BC Tel feed of KING might not set kindly with BC Tel. Paige: ''**I phoned them up and told 'em. They got a wee bit uppity and so I said** See here - we didn't ask you to irradiate that pasture (where the translator and TVRO are located) with your bloody microwaves. So since it is there we are going to erect a 'passive collector' to get KING-5. **Take that and stuff it!**''.

The next morning I packed up and walked down the street to say goodbye at Fuller's Esso station. In the four days I spent at Hixon I had made many very good friends. Folks like Gordon Harris at who's house I stayed and Ken Vaughn who made the quonset hut available. All of the men who endured the cold, the runny noses and the cut knuckles to raise the dish on Sunday evening. In Hixon it's what you do or are willing to do that counts; not your title or how much money you have in the bank. It is quite a town and I am certain there are hundreds more like it spread throughout western Canada.

To get out of Canada's north I was to travel to Prince George. Chris warned me about the town: ''Prince George's a wide-open boomtown. I've heard tell of hookers tossing pebbles against the hotel windows to get business!''. Certainly didn't sound like upstate Illinois to me!

One of the Kamloops chaps drove me to Prince George and I took a third floor room at The Inn Of

The North. It would take a hefty arm to toss a pebble that high...still...

I settled onto the telephone to touch base with northern Illinois. I phoned my fabricator in Alsip (Ill.) to report that a key component in the Hixon dish had been dimensioned out of spec making proofing to + /-.050 inch RMS parabolic tolerance unnecessarily difficult. I was headed to Colorado next and that would also be a bear to do right. How about the dish for Sevierville, TN? Same problem. He agreed to correct the problem on the sixteen dishes in fabrication right away. That, I decided, was the way to do things. Go out into the real world and **look** for on-site problems. **Promptly** report them and see that the next people didn't have the problem.

Several more telephone calls and it was time for bed. Humm. No pebbles tonight.

The next day I was up early for a day of traveling. First Prince George to Calgary. I was headed for Paraframe dealer Warren Foster who lives at Grand Junction, Colorado. An unexpected treat of the flight was a two hour dogleg to the north to Dawson Creek on the way to Edmonton. At high noon in Dawson Creek the sun is barely 11 degrees above the horizon; a strange site to one who lives at latitude 40-41! Arriving at Edmondton later in the day a chap named Wally Baydala sat down next to me. He eyed my camera. "A tourist 'ay?"

We chatted and I explained I was in the area on business.

"What sort of work do you do?" he asked. I explained that I manufactured satellite TV antennas. "**Eh! Tell me more!**" Like every western Canadian I had met along the way Wally voiced the frustration and concern that the eastern (Canadian) bureaucrats impeded them from effectively utilizing their resources to generate a higher standard of living and wealth for all Canadians. Wally mused "Why not make the pie bigger rather than trying to redistribute what's now available. The business climate out east is so bad that even the Royal Bank of Montreal is moving out here!". And then he lowered the boom. "**I'd like to have a TVRO at my house in the country outside of Calgary**." And you know something...I think he will, soon!

Arriving at Calgary I discovered the flight to Denver had been cancelled; a big snowstorm rolling down the Rockies was the culprit. But the next day when the storm had cleared there was a repeat of my earlier encounter.

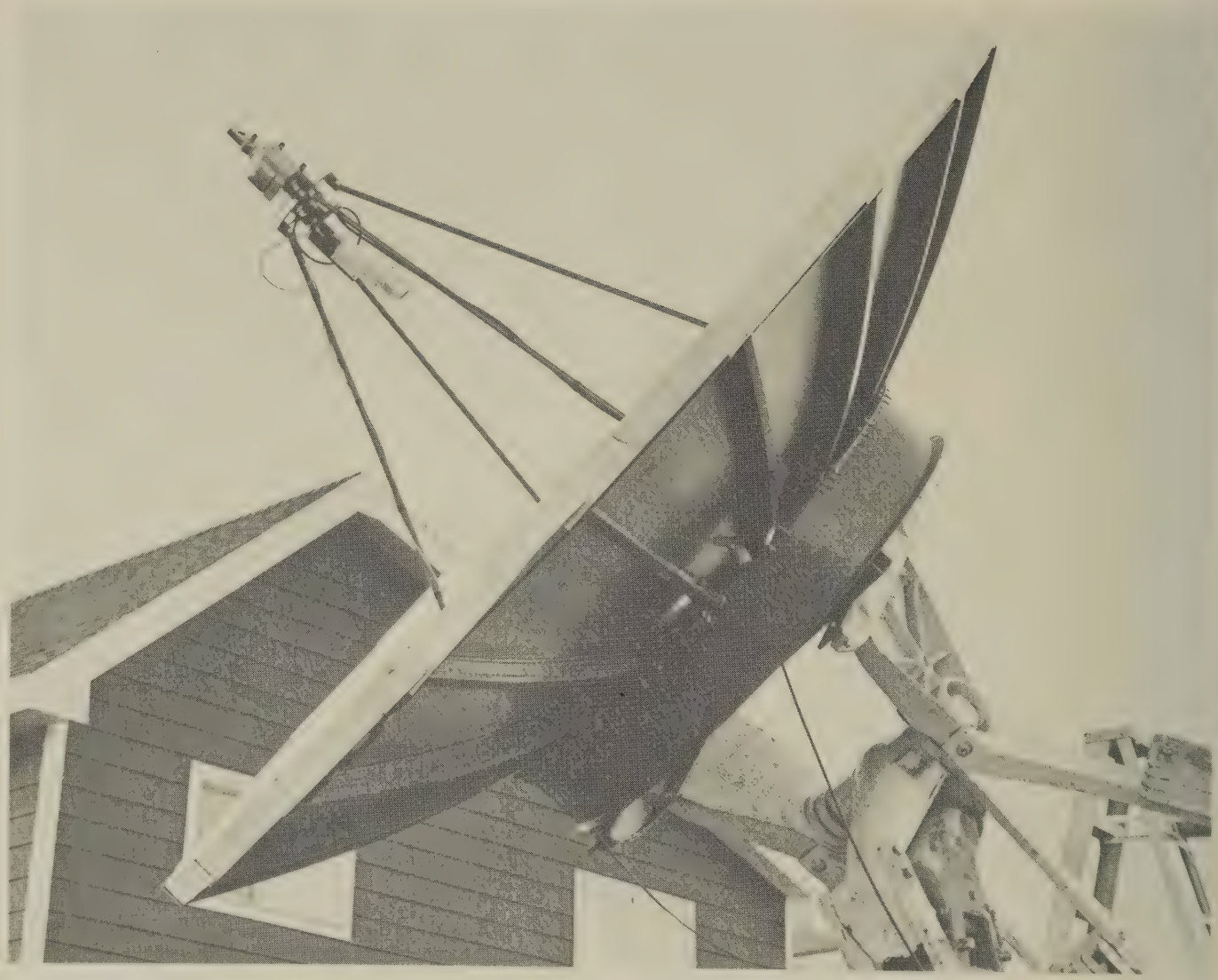
Seated next to me: "**Our real estate company in Calgary is doing a lot of developing in the Denver area. We would like to explore installing a TVRO for the homes we are building there**". And once again, I think they will not only explore it but install one; soon. Furthermore I think **anyone** with enthusiasm can sell **one** brand new TVRO terminal **per day** simply by getting around and talking to people. The market, truly, is huge!

Near Collbran, Colorado at Warren Foster's Circle 4F Ranch we were to install an ET/3.66 on an

THE DAY AFTER - Paraframe ET/3.66 up and operational for the 300 people of Hixon, British Columbia.

equatorial mount which Warren had bought from California's Lance Ginner. These are super mounts! It had declination controls which make it a real one-adjustment system; with it we would be able to roller skate across the full geo-stationary orbit (and Molniya too if you wish - ed.). But first we had to get the antenna up. The mount was bolted to the top of an eight foot pier. It seems that early on last fall when Warren was shopping for equipment and advice somebody told him that F1 was just twenty degrees above his horizon. Later when Warren's computer printout arrived (***1**) he learned that from his location F1 was really 37 degrees up!

The dish was finally installed atop the mount but not without problems. Warren's backhoe had a sticky hydraulic valve and as we were lifting the dish the backhoe dropped it two feet onto its edge! The last foot was pure free-fall and all 600 pounds of dish landed on the ends of the ribs and the lip of the aluminum skin. **Then** the backhoe dragged the antenna sideways another three feet with the face-down aluminum skin plowing the dirt and taking a nasty bending. It was a wonder the bottommost panel didn't tear off of the framework. **I now believe** our worst-angle windload survival rating of 125 MPH is **very** conservative.



50 CHANNELS OF TV FOR THE FOSTER RANCH - the ET/3.66 mounted on the equatorial mount obtained via Lance Ginner from Stanford's radio astronomy project makes a dandy package for sky searching. Slight cosmetic damage on near edge of antenna was result of backhoe dropping antenna to ground and then 'digging it in'!

The ET/3.66 performed perfectly. And the Foster household made a quantum leap courtesy of technology from one and one half TV channels (one Grand Junction plus a snowy translator, both via a pair of hilltop mounted yagis and 2,000 feet of CATV hardline plus various electronics) to over 50 channels. The **only** transponder on **any** bird that didn't look letter perfect was F1's transponder 9 (C-SPAN). But then the Heliax had not arrived at that point so we were driving 80 feet of RG-8/U coaxial cable (***2**). And this was with a 12 foot aperture ET/3.66, an SCI 120 degree LNA and Andy Hatfield's AVCOM PSR-3 receiver.

Putting myself in the shoes of the Foster household, I could imagine the emotional highs and lows they felt as the dish went together, fell unceremoniously just as it was being raised, and then hours later provided television like they had never seen before!

As I had anticipated after Hixon (BC) some of the antenna components for Warren were dimensioned out-of-spec so it was a real challenge to generate the reflective surface with the necessary precision. Thanks to the **Paraframe Proofing Template** we identified and corrected the problems. Thanks to being in the field with the installation, others could be corrected in advance.

Well, it was of course good to get home. Henry Turek of Oak Forest (IL) who 'came out of the woodwork' during SPTS '79 as an interested spectator had been busy while I was away; turning out enough ribs for another dozen ET/3.66 antennas. The fabricating company was fast solving another problem which I learned of while I was at Foster's in Colorado. An Illinois customer had paint peeling on one of our ET/4.85 (15.9 foot) antennas. We had stopped shipments until we could identify the source. This problem too was

resolved resulting in a vastly superior coating for all new antennas and a quick on-site fix for any already in the field with that problem.

Shortly after arriving home I used the telephone to guide Wayne Ayers down in Sevierville, TN in the assembly of his ET/3.66. His was the last unit built out of mechanical spec. His partner, John Tarwater, is a Grand National mechanic on the NASCAR circuit and with some minor telephone guidance they managed to assemble the dish and achieve an RMS accuracy of +/- oh-three-oh (!). Wayne was to bring some photos of his installation (which includes an SCI 120 degree LNA and another of AVCOM's PSR-3 receivers) down to Miami's SPTS '80. He also promised to bring his High School yearbook to prove to me that he went to school with Dolly Parton. Wayne probably learned close tolerance work while attending high school.

And this postscript. When I was at Warren Foster's I read in his **CSD** that Oliver Swan was in the hospital. And now what a shock to learn of his passing! I had looked forward to sharing my BC experience with this great man because Oliver, like Bucky Fuller, understood that technology unfettered by politics and red tape is mankind's ladder to a better and nobler existence.

Those of us who strive to advance satellite television technology to new levels are fellow travelers in a great and wonderful adverture; kindred souls who experience an empty feeling inside upon learning of the departure of our fellow traveler, Oliver Swan.

ANIK B as received at the Foster Ranch in Colorado on ET/3.66; picture off of Hitachi portable TV!

[*1] The satellite enthusiast can obtain his own computer chart of elevation angle and azimuth to the full geostationary horizon [the whole 'visible' belt from your location] from: Bill Johnston, 1808 Pomona Drive, Las Cruces, N.M. 88001. Enclose a large [9x12] envelope with 28 cents postage addressed to you and one dollar for IBM-360 printout.

[*2] Many transponders 'power down' during periods when no programming is being transmitted simply to save money [operating electricity of the uplink site and wear and tear on the uplink final transmitter amplifier]. Thus when C-SPAN and others are transmitting color bars you may notice heavy amounts of sparklies; due to their reducing the output of the transponder through the simple ploy of reducing the input. If you notice one or more transponders running color bars and they have sparklies, don't panic; chances are they have simply 'powered-down'.

PROGRAMMING PERMISSION & LICENSING

CANADIAN RIDDLE

Canada which led the world with geostationary DOMSATs (ANIK I) is as readers are aware again the leader with the operational launch of the first DOMSAT 12 GHz system. In another related area, domestic viewing of non-domestic (to them) satellite video signals is another area where it would also appear that Canada is leading the satellite world.

Canada's own domestic system has been faulted both from within and without by those who have decryed the underuse of the ANIK system in solving the needs of those Canadians who do not happen to live along the U.S. border. Canada led the world in cable television system engineering and innovation for several decades largely because U.S. signals are 'just over the horizon' from most of the major Canadian population centers (Vancouver, Toronto, Montreal, etc.). The lure of U.S. programming for Canadian veiwers has been considerable since the U.S. began broadcasting in the 1946-48 era and Canada's first television stations did not begin until 1952.

The first known and publicized Candian private terminal sprung up in the Canadian north in the summer of 1977. It lasted operational only a few days before an irate Canadian authority shut it down. From that small seed and plenty of press in Canada has grown a network of **still illegal** TVRO terminals which knowledgeable inside sources now estimate totals between 450 and 600. Very few if indeed any of these 'illegal' systems tune in the Canadian ANIK satellites; they exist because they are receiving U.S. programming (primarily from F1).

Many of these terminals are operated in some form of **cooperative community effort**; not unlike the Hixon, B.C. terminal Jim Vines writes of in this issue of **CSD**. That simply means that the government authorities are facing whole communities rather than isolated individuals when they seek to shut down the pirate systems. And as the Candian authorities have stated again and again, it would serve no purpose to shut down these terminals (in what many predict would be a literal bloodbath in some instances) as long as there are no Canadian programming alternatives for the terminals and the communities they serve.

Most of these terminals distribute the SATCOM F1 programs to homes in the area via either cable systems or via rebroadcast transmitters (in effect low power VHF translators). Both cable systems and VHF (or UHF) translators are licensed and governed by the CRTC/DOC; the twin arms of Canadian communications policy and law. Thus Canadian

communities operating illegal terminals are **also** often operating illegal cable and/or translators as well. Most such systems are well engineered, well funded, certainly well supported and they operate to professional standards.

In addition to those terminals operated for multi-family groups (i.e. communities of one sort or another) there are of course the true private terminals installed by individuals for their own pleasure. Most of the Canadian concern is with the **community systems** at the moment; not with the truly private (individual) systems.

Into this comes the Canadian Telesat system; the consortium of private (largely telephone company) industry and government which funds and operates the ANIK system. Telesat's latest achievement has been the operational status of the 12 GHz transponders on ANIK B (parked at 109 degrees west). There are six transponders in this service, each with 20 watts peak transmitter power and each occupying a 72 MHz wide channel (i.e. twice of the width of the 4 GHz channels). As Canada pioneered the 4 GHz domestic service, Canda is now pioneering the 12 GHz domestic service.

The ANIK B bird carries in addition to the six transponders on 12 GHz a total of 12 standard format (36 MHz wide) transponders on 4 GHz (downlink). The bird is configured so that because of primary power supply limitations only 12 total transponders (4 GHz and 12 GHz) may be transmitting at full output power at a time. Additionally, because of the heavier power load no more than 4 of the 12 GHz transponders may be utilized at a time.

The ANIK B 12 GHz capability is Canada's future; Candian authorities believe that they not only must demonstrate to the world Canada's technology achievements in this area (in order to produce a marketplace worldwide for Canada's 12 GHz electronics hardware) but also to curb the prairie-fire growth of **illegal 4 GHz terminals** now spreading throughout Canada. The key to bringing 4 GHz pirate terminals under control (at least where these terminals are located to serve whole communities) is to get a good selection of alternate television programming onto satellite (**on 12 GHz**); in this case Canadian programming for Canadians.

The grass-roots failure of the Canadian Northern Service (two English language channels and one French language channel), as it grew on ANIK III and has subsequently expanded to ANIK-B, to grab and hold the interest of Canadians living in the far north has been dramatic. The two English language channels are programmed as a **network feed**, as opposed to being a 'super station feed' and this has allowed the programming bureaucrats to re-arrange and select programming to suit what **they perceive** the needs of the northern Canadians must be. The service generally lacks feeling and it comes across as a stiff-upper-lip communications forum whereon the southern bureaucrats talk down to their northern rural country cousins. This was not to be a mistake the ANIK B service would re-make at 12 GHz.

The 12 GHz feed now on ANIK B presently carries the CBC Vancouver outlet (CBUT which is terrestrially on VHF channel 2) and the independent (CTV) network feed also serving Vancouver (CHAN). Thus the 12 GHz service now has a pair of 'super stations'; real, live **broadcast** feeds without the sticky fingers of government bureaucrats getting in there to mess around with programming selection and sequencing. The ANIK B feed on 12 GHz is presently configured so that CBUT and CHAN **share** transponder six. That means there are **two** 36 MHz wide video signals (with accompanying audio subcarriers) which operate in the 72 MHz bandwidth transponder. As we shall see this is important since it allows recovery of **both** with relatively simple receivers. Also on ANIK-B at the present time is the BCIT (British Columbia Institute of Technology) on transponder 5; a college level series of courses for educational purposes. This signal operates in the 1/2 transponder format as well. The only other video on the ANIK B 12 GHz service is occasional TCTS (Trans Canada Telephone System) testing.

It has been variously reported (including here in **CSD**) that the primary source for Candian receivers for this 12 GHz service is a Saskatchewan firm called SED. They have been under contract providing Telesat their 4 GHz receiving equipment for some years and until recently a ten-receiver-per month capability was about their limit. With the expansion to the 12 GHz service SED has grown but not dramatically.

SED, **we understand**, builds a downconverter/antenna package that consists of either 3 or 6 foot dishes (for 12 GHz) with buttonhook feeds, an LNA (specified at 4.5 dB noise figure which at 12 GHz is quite respectable) and a downconverter that has a 1,000 MHz (1 GHz) i.f. The cost of this package, which **ends at** 1 GHz, is reported to be in the $3,000 per terminal range (there have been reports of $500 terminals but this number is largely discounted as nothing more than a **projection** of what such downconverter/LNA/antenna packages **could be sold for** if there was sufficient volume).

SED quits at the 1 GHz downlink i.f. A second Canadian firm, Electrohome of Canada, picks it up there with a demodulator system that starts off with a 1 GHz input. The Electrohome demodulator has a tuneable AFC (automatic frequency control) system which allows it to be 'swung' **within** the 72 MHz wide channel to recapture **either** the CBUT **or** the

CANADIAN SATELLITE DIFFERENCES

ANIK B - Operates on 4 GHz and 11/12 GHz downlink. Operating power is 10 watts peak at 4 GHz and 20 watts peak at 12 GHz.

1) **Audio** - standard is 6.8 MHz subcarrier. Additional subcarriers are typically found on 6.17 and 5.41 MHz. The audio preemphasis utilized by ANIK is **not** compatible with the US DOMSAT audio totally. US audio is 15 kHz with 75 microsecond preemphasis. Canadian is 5 kHz and audio deviation is set against a standard of 50 kHz RMS fed by a +8 dBM test tone at 1 kHz. Instantaneous program peaks may exceed 160 kHz deviation.

a) Audio channels are 'stacked' and to ensure that there is no 'cross talk' in the receiver a **5 kHz low-pass filter** must be installed in the audio system (this sounds like a constant background 'chatter' or tinkling of bells on a receiver that has the normal US audio bandwidth and preemphasis).

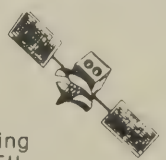
2) **Video** - The 4 GHz downlink frequencies are the same as other ANIK B and US DOMSAT transponders. All polarization is linear (horizontal). The 12 GHz transponders are also linear (horizontal) and they are assigned as follows:

Transponder 1 = 11,740 MHz center frequency
Transponder 2 = 11,820 MHz center frequency
Transponder 3 = 11,900 MHz center frequency
Transponder 4 = 11,980 MHz center frequency
Transponder 5 = 12,060 MHz center frequency
Transponder 6 = 12,140 MHz center frequency

Thus with the CBUT/CHAN split transponder format the center of the lower program service would be found at 12,120 MHz while the center of the upper program service would be found at 12,180 MHz.

MAKE INTELLIGENT PROGRAMMING DECISIONS...

...with **SAT-Guide**



Twenty channels of programming today on FI, soon 35 on FI and FII. Keeping up with what is 'up', when, is almost impossible. Until SAT-Guide.

ALL FI programs on **all** transponders are listed in this unique programming guide to satellites. INCLUDES daily program listings PLUS monthly summaries of movies, sports and specials. Only $28 per year from:

SAT-Guide P. O. Box 1569
Division of Commtek Hailey, ID 83333

CHAN video (plus subcarrier audio) independently. Because the actual modulated bandwidth of the 12 GHz signals is the same as the 4 GHz service signals (i.e. 36 MHz maximum), a standard DOMSAT video receiver will work as an i.f. for this service. A designer could create a downconverter that scoots the 12 GHz incoming signal down to some transponder in the 3.7 to 4.2 GHz range and then tune in the CBUT and CHAN feeds using a standard DOMSAT receiver on two adjacent (same polarization such as 2 and 4) dial positions.

The system is technically performing well. The basic differences between it and US DOMSAT signal sources is shown separately here. There are a couple, including the Candian audio system which differs quite markedly from the US DOMSAT audio system (Canadian audio is recoverable on a stock US DOMSAT receiver but it is not clean or crisp unless you make some audio demod modifications as outlined in the new **Washburn TVRO Receiver Manual**).

Underlying all of this new technology is the political importance of the system. Canadian authorities are determined to stop the pirate terminals now mushrooming in hundreds of Canadian communities. But to do this effectively they must be able to face the electorate squarely in the eye and say "**YES - there are viable alternatives NOW available via ANIK B**". By combining two super station feeds (CBUT plus CHAN) and throwing in the BCIT educational programming, they are most of the way to that point.

Several Canadian observers feel that had not the present Government lost its backing in Parliament the crack down would have begun already. They feel that as soon as new general elections have occurred and there is once again a Canadian leader and government in place, the crack down on **community owned and operated** pirate terminals will begin swiftly.

How might this work? Obviously the Canadian authorities inside of the CRC (Canadian Research Council; the group presently administering the Telesat and ANIK B service) are not about to give away their battle plans in advance. **However**, knowledgeable Canadian observers see this scenario unfolding:

1) First will come an anouncement telling all operators of illegal, private TVRO terminals now receiving (illegally) US programming to cease and desist. The announcement is expected to point up that through ANIK B viable Canadian alternatives now exist (i.e. CBUT and CHAN plus BCIT).
2) **Expecting a revolution**, a second announcement will tell those then-existing terminals that "upon reconsideration the CRC has decided that those 4 GHz terminals now operating illegally, receiving U.S. signals, may continue to operate," provided:
   a) They **also** install 12 GHz terminals to **add** CBUT and CHAN (plus possibly BCIT) to their systems, and,
   b) They immediately **cease carrying** any U.S. program sources other than one (or perhaps two at most) of the U.S. super station signals (i.e. selecting between WTBS, WOR, WGN and KTVU). **No**, they may **not** carry other U.S. cable feeds **such as** HBO, SHOWTIME, SPN and so on.
3) Having at that point stated their 'bottom line' the CRC/DOC/CRTC will then advise that these then-existing terminals will be grandfathered (i.e. allowed to continue operating), but that no **new** ones will be permitted. Furthermore, if the existing terminals do not (1)install 12 GHz ANIK B receivers, and, (2)cease reception and redistribution of non-broadcast U.S. signals (such as HBO et al) they will then face being shut down; **by force if necessary.**

Again this is a presumptive assessment of what several knowledgeable Canadian TVRO people see coming. Is that the end of the brief but spirited Candian pioneering experiment in across-the-border domestic satellite service? No, not quite. The CRC people recognize that as long as there is a proliferation of hardware capable of receiving these US 4 GHz signals that some problems will continue. The **individual homes** engaging in private reception are **not** an immediate concern to the CRC/DOC/CRTC. The community fed systems are. So down the road, in the 1981-82 timeframe, when ANIK-C is launched (it will have 16 11/12 GHz downlink range transponders each 54 MHz wide) the present plan is for the Canadians to totally abandon the 4 GHz service for video. All Canadian satellite video will eventually, we are told, end up in the 11/12 GHz service region. They rationalize that they can never totally 'stamp out' illegal 4 GHz terminals 'pirating' US signals from across the border but they can shift Canadian technology to the 11/12 GHz band where eventually the 4 GHz equipment now available will either dry up or become a bootleg item for across-the-border smuggling. In the former case they will say 'good riddance' and in the latter case it will become more easily controlled. At one point in time in the not too

SATELLITE TV EXPERIMENTERS
INTRODUCING A COMPLETE
3.7 — 4.2 GHz DOWNCONVERTER
•3.7-4.2 GHz in. 1Hz out
•Remote, one uning
•Dual conv le
•Assemb ly $895.
Polar M e Feed Rotation
Dish.
SU tpaid
EXPER PLIES
•Teflon PC B nt 2.55
1/16''x9''x3'
1/32''x9''x4''
•Chip capacitor k 8, 27,
39, 220, 4700 pf...
•SMA and microwa ire
•2''x14'' copper tube eed, 3 lbs.
$12.00
WRITE - We are adding to our inventory!
SATELLITE INNOVATIONS
P. O. Box 5673
Winston Salem, N.C. 27103
Add $2.00 shipping and handling (except for plans)
THIS PRODUCT NO LONGER AVAILABLE

FOR YOUR EARTH STATION, CHOOSE
AVCOM'S PSR-3
SATELLITE VIDEO RECEIVER
DESIGNED FOR YOUR PRIVATE TERMINAL
•Remote tuning
•Dual video outputs
•Exclusive Clamp-Sync & Scan-Tune
•Many other features!
AVCOM of Virginia, Inc.
10139 Apache Road, Richmond, VA 23235
(804)320-4439

distant past it was illegal in Canada to even **own** (as in possess) a 4 GHz TVRO receiver, LNA or antenna!

Canada is wrestling with a considerable problem. They are looking for solutions which satisfy the people who until now have been deprived of quality real-time television. They feel the solutions must be implemented in a way that encourages retention of the Canadian national identity without simply allowing the overwash of American television to socially convert Canada into a 51st state. At the same time there is an intense desire to establish Canada as a worldwide technology and hardware source for the coming age of satellite communications. It is a difficult problem to say the least.

SPTS '80 REPORT
REAL WORLD
MARKETING BEGINS

After months of waiting and guarded preliminary announcements the private terminal marketing effort got the big shot in the arm it most needed during the Satellite Private Terminal Seminar held in Miami February 5th - 7th. **CSD** estimates that no fewer than 750 brand new private terminals will be installed as a direct result of orders placed for equipment during the Seminar with a wholesale equipment value in excess of $2,500,000. In addition to this brisk activity at the show itself a number of substantial 'large-quantity' buyers emerged during SPTS asking for quotations for hardware that will total perhaps another $5,000,000 in wholesale level sales during the next six months.

Some of the estimated statistics are mind boggling. We talked with the exhibitors before, during and after the Seminar to keep tabs of just how the purchasing activity was developing. Here are some of the highlights:

One antenna manufacturer wrote on-the-spot orders for more than 200 units while a second antenna exhibitor has been asked to bid on 1,000 antennas to a single buyer.

An LNA supplier wrote on-the-spot orders totaling in excess of $100,000.

A receiver supplier wrote orders for more than 250 units and reports his firm is developing bids for an additional 450 units as a direct result of SPTS.

The trend was definitely towards relatively large orders from firms now entering the private TVRO field intending to distribute in their local areas completely installed terminals. Antennas, receivers and LNAs being ordered in the 25-quantity range was a common-place event.

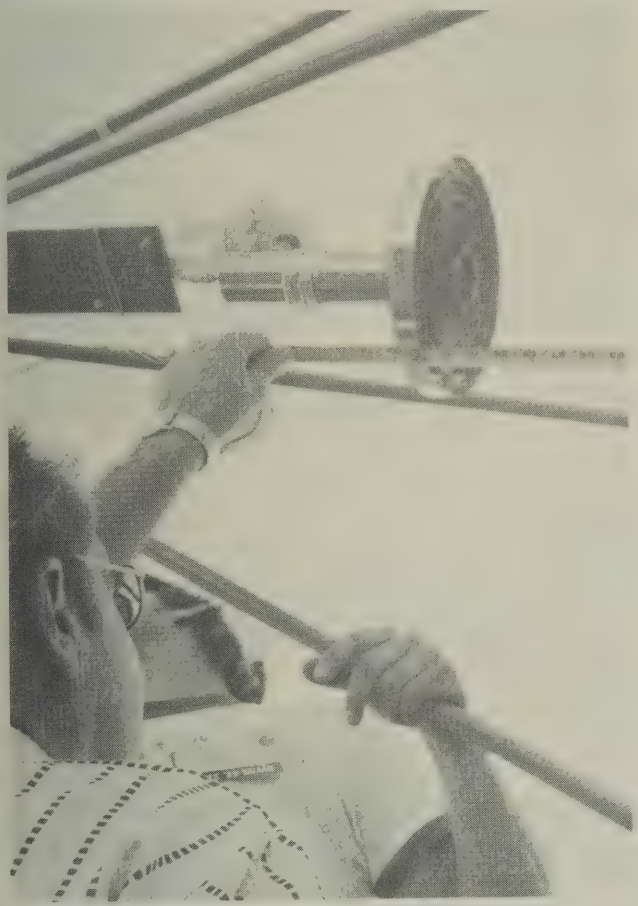
The interest in large quantity orders came to SPTS from throughout the world. Several Canadian distributors were chasing both 4 GHz and 12 GHz terminals. It turned out that one exhibitor can now supply 12 GHz terminals produced in Japan for around $1200 each [1] in small quantities. And there was every indication that Japanese produced 12 GHz terminals will cost about half that much as soon as quantity production begins (possibly before the end of this year). Several attendees noted that at least for the moment the US and Canadian suppliers should be relieved that the Japanese electronics industry has **not** opted to enter the 4 GHz marketplace with 12 GHz terminal prices like these!

An attendee from the South Pacific made waves of his own by shopping for an initial quantity of 1,000 terminals (4 GHz) for use in the Pacific Basin. The firm he represented distributes videotaped programs to approximately 7,500 VCR machines scattered from Australia north and northeast to the equator. His concept was straight forward; he intends to lease INTELSAT (Pacific) time each day to feed television programming back into the area utilizing either a spot beam (**if** INTELSAT will agree to lease him one) or in the worst case a hemispheric beam. He will program the daily feed and lease/rent/sell the terminals throughout the area. Anyone who is already distributing daily television programming to some 7,500 VCR machines scattered over thousands of miles of Pacific Ocean has got to find satellite transmission a far less expensive technique and it holds out the hope that at some point in time he could also add direct live events to the system as well.

ANDY HATFIELD with plenty of helpful hands tweeks and adjusts on his AVCOM receiver during the INTELSAT search operation.

INTELSAT has always seemed to be beyond the receiving system capabilities of 'low cost' private terminals. SPTS '80/Miami will be remembered as the turning point for that assumption. Bob Cooper had arranged for England's Steve Birkill to airship a Hybrid Mode feed (see **CSD** for February, Technical Section) with which Jim Vine's 15.9 foot ET/4.85 **Paraframe** antenna would go looking for the Russian Molniya (inclined orbit) and Statsionar (geostationary) birds. We picked out the Russian birds because we felt their **estimated** 29 dBw EIRP contours were 'do-able' even on a 16 foot antenna. Late in the afternoon on February 6th an ad-hoc group of enthusiasts retired to the parking lot to retro-fit the ET/4.85 antenna with the Birkill feed. Alas, it could not be found. After re-checking the Birkill feed on a linear polarized signal

(WESTAR I) the decision was made to swap out the special feed for the standard linear feed and try again. While this was being done Gene Martin and Ted Spillar of **Star Antenna** (Lafayette, LA) brought their 4 meter polar mounted antenna on around to the east. Under the direction of Andy Hatfield who provided an **AVCOM** receiver for the test a picture was found far off in the eastern quadrant. After tweeking up the antenna, numbers and letters approximately 1 inch high on the

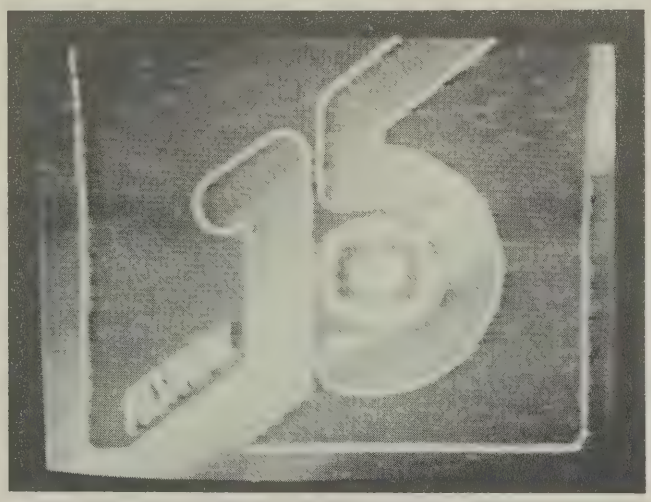


72 INCHES TO THE FEED - Birkill Hybird Mode feed being adjusted to position on Paraframe ET/4.85 parabolic.

19 inch monitor could be read and the signal was identified as a BrasilSat feed from Sao Paulo (Brazil)! Subsequent checking revealed the **Star** 4 meter antenna was homed in on INTELSAT's IVA-FI bird at 24.5 degrees west and the Brazilian station was operating in a 26 dBw hemispheric beam pattern feeding programming to remote Brazilian terrestrial TV stations.

And then the fun really began. While the **Paraframe** crew brought their ET/4.85 antenna around to the same heading Paul Shuch appeared with a prototype of his 'next generation' TVRO receiver under his arm. Over the next hour under Shuch's and Hatfield's direction additional receivers from **AB Elecronics/VHF Engineering** and **International Crystal Manufacturing Co.** (ICM) appeared on the table and all were directly compared for performance on the weak INTELSAT signal. The photos included here are of the Sao Paulo/ INTELSAT reception utilizing the prototype Shuch receiver.

During the course of the trials Andy Hatfield found that this particular INTELSAT feed (Andy reports it was located around transponder 20 in the DOMSAT world) was carrying subcarrier audio in the 6.55 MHz region. Several sporting events (including a soccer game), news, a feature film and various short features were watched and enjoyed by a crowd of approximately 100 people.



SAO PAULO VIA INTELSAT - utilizing power meter provided by Andy Hatfield we measured peak CNR's in the 5.5 region on linear polarized feed and ET/4.85 antenna. Just graduating to the hybrid mode feed would have bought us 3 more dB!

The "news" that INTELSAT reception was practical with antennas as small as 15.9 feet (utilizing standard DOMSAT receivers and a 120 degree LNA) spread rapidly on Thursday morning. Bob Behar's **AB Electroncis** had it piped into their exhibit booth by 10 AM. The timing was perfect because a 9 AM session on Thursday was titled "Reception Problems and Opportunities in the Caribbean, Central and South America". More than 75 attendees from this region of the world had been struggling with the special problems created by rapidly diminishing signal levels from US DOMSAT birds in their sector of the hemisphere. Even in the middle Caribbean 8 meter antennas looked like the minimum size that would produce sparklie-free pictures from DOMSAT with 10 meter antennas required in extreme southern Central America. For northern South America the DOMSAT signals looked marginal even with ten meter antennas. Some calculations indicated that **with** the Hemispheric pattern signals from INTELSAT (26 dBw) a combination of a 6 (or 7) meter antenna, 120 degree LNA plus a good quality phase lock loop demodulator would produce good quality (if not perfect) signals. Attendees from such diverse locations as Ascension Island and South Africa were equally joyed to see the test results since it placed them in a position where they too could enjoy satellite TV reception.

The events of the February 6th tests were videotaped by both Chuck Azar's **INSTANT REPLAY** crew and attendee John Fulmer. Excerpts from these tapes are now running on Coop's

Thursday **Satellite Magazine Program** (transponder 21, 12 noon eastern) and a special INSTANT REPLAY videotape feature on this exciting new application of low cost private terminals will be available shortly [2].

Several sessions during SPTS '80/Miami were devoted to the crucial question of programming access and 'terminal justification'. One especially important session was conducted by Bill Luxom, President of the **American Educational Television Network** (AETV). This firm will begin transmitting (transponder 10 and 12) very specialized on-going (or continuing) education programming around the first of June; programming that allows professional people such as doctors, real estate brokers, nurses and so on to maintain their annual quotas of 'education'. Luxom pointed out that many states are now requiring their professional people to 'stay current' as a condition for their 'licensing' to practice. His AETV program allows a professional person to take fully accredited courses (with tests and study packages) in his own home or office and to satisfy the state requirements or in some instances national requirements. Luxom also noted that his firm will be contracting-out many thousands of terminal installations in the years ahead and he appealed to the attendees who were entering the terminal sales and installation business to stay in touch with him. You can contact AETV at 400 Golden Shore (Suite 302), Long Beach, CA 90802 (213/590-5691).

In the closing session on Thursday the attendees discussed forming an international 'trade association' of

NOT BANNED IN BRAZIL - cigarette advertising plus the usual assortment of international products [GM Brasil, Coke, etc] was seen. Some of their commercial periods are as long as our program periods!

THE BIG MOMENT - an anxious crowd numering perhaps 100 strong at the peak witnesses the first public INTELSAT reception on a small terminal. That's the STAR 4 meter antenna that found the first INTELSAT reception in the background; we were so close to threshold we had to constantly ask people to move back away from the front of the antenna to keep absorbtion losses to a minimum!

private terminal owners, operators, installers and manufacturers. A formation committee was created, headed up by **Eugene Martin** of **Star Antenna Manufacturing Co.** (1575 Antiqua Drive, Lafayette, LA 70503) and all of the attendees at SPTS '80/Miami will be receiving a letter shortly from Gene outlining the initial goals and proposals of the group. **CSD** urges anyone who was not in attendance to contact Gene Martin regarding this new association; if you are involved in low cost satellite terminals in any way **you need to be a part of this!**

As the companion report appearing in the Technical Section of **CSD** reports, this SPTS was a very exciting event. The next SPTS will be held late in June (or early in July; exact dates will be announced in mid-March) in the southern portion of the San Francisco Bay Area. See you there!!!

[1]If you are interested in learning more about the newly available Japanese 12 GHz terminals CSD suggests you contact James M. Janky at VITA-LINK [701 Welch Road, Suite 225, Palo Alto, CA 94304]; [415/497-4521].

[2]To inquire about the special videotape reports available documenting SPTS '80, contact INSTANT REPLAY at 2980 McFarlane Rd., Coconut Grove, FL 33133; [305/448-7088].

PROGRAMMING CORRESPONDENCE

A TRUCK LOAD IN CRANE LAKE

Recently a friend of mine was watching a TV program that originated in Winnipeg. They were interviewing a man who maintained that it was possible to build an antenna that will pick up TV signals directly from a satelite at a cost of $500. A recent **TV GUIDE** article speaks to this subject and indicates that firms in Canada and Japan are now building and selling such terminals for $300 to $400. I have a friend who is an electronics design engineer. He would certainly be capable of building such a device if there were plans available. Do you have such plans that can be purchased?

We are in a remote area of Minnesota and TV reception is lousy at best. If I had a truckload of such a device in Crane Lake they would be sold in 5 minutes.

John P. Bodkin
Crane Lake, MN 55725

You can build **an antenna for $300 or even less. To that you have to add the LNA + receiver package which if one follows Robert Coleman's approach can be done for perhaps $500. The Coleman TD-2 Conversion Manual** (available from STT for $30) **tells how to do it. The Canadian and Japanese $300 to $400 terminals are for the** experimental **11/12 GHz satellites that provide spot-beam coverage in both countries. In Crane Lake you could get excellent reception from the ANIK-B 11/12 GHz service** (being almost into Canada) **but you'd probably be more at home with 4 GHz service from either ANIK-B or from SATCOM** (or both).

There are hundreds (if indeed not thousands) **of Crane Lakes all over America. Not many people live in Crane Lakes so we don't realize how for more than 25% of the land mass area of the U.S. there is not even** ONE **television channel available off air. TV stations naturally get built where people concentrate. Crane Lake is not one of those spots. A study commissioned by the U.S. Senate back in 1975 reported more than 1,000,000 U.S. homes still have** NO **television reception.** Crane Lakes arise

CHRISTMAS BIRDS

I am intrigued about the possibility of receiving satellite TV here on Christmas Island, located in the Indian Ocean some 250 miles southwest of Indonesia. We have two primary problems here; our lack of knowledge of what satellites are available to us, and the use of PAL 'D' (Australian) receivers and video. What can we expect here and how will it work?

G. T. Presley
Christmas Island
Indian Ocean

The 'easiest' satellite family for you to locate on Christmas Island will be the Palapa series of birds with Palapa I at 83 degrees east and II at 77 degrees east. Palapa is operated by the Indonesian Pertel and our EIRP map file shows it to have a 31.5 dBw footprint on your island. That puts you in 'tall cotton' even with something like a 12 footer with a 120 LNA. Indonesia operates the same PAL standards as Australia (our sources call it PAL 'B' rather than D). **Other birds within shot would include INTELSATS over the Indian Ocean, the Pacific, various Russian birds and a fair number of experimental birds including a new Indian bird due to go up this summer.**

The various video standards in use in the world today are at best confusing to those of us who were brought up on NTSC **color. Sony markets a standards-switchable color monitor** (PVM-1850PS) **which allows you to switch between PAL/SECAM and modified NTSC. That's one approach to being able to resolve** (in color) **anything the birds can throw at you** (this 18'' monitor lists for around $1500 and can usually be bought with discounts for around $1300). **The day is coming where anyone seriously 'into satellites' will want to have a switchable monitor system operational. We'd like to hear from a reader who knows enough about what is involved in all of this to prepare a good report for publication here in CSD.**

EVERYONE WANTS ON THE BIRD

I represent a group of video-oriented Memphians involved in public access narrow-casting on Memphis CATV channel 32. I enjoy your weekly program on the Satellite Program Network which is carried on the Memphis CATV system on channel 25. We are interested in producing a program for public access on the concept of home satellite receiving systems. Can you help us gather the data to prepare such a program?

Randall Lyon
Televista Projects, Inc.
Memphis, TN 38107

Our SPN program this past few months has not had the attention we wish it had received primarily because of the press of other activities, and, because our production arrangements with a local university have been something less than ideal. As more and more satellite enthusiasts either get tuned in via SPN or develop their own abilities to receive the program directly we will be spending more time seeing that the content (and production quality) **of the weekly SATELLITE MAGAZINE show is brought back up to a high level again. Those who attended SPTS '80 in Miami will enjoy reliving some of the highlights of the Seminar during the March-April period.**

UP ABOVE DOWN UNDER

I read with interest a recent article in the July 1979 issue of **QST** describing what a couple of enthusiastic hams (G8AKQ and K4AWB) have been doing with low cost satellite TV reception equipment and experiments. This has really spurted my enthusiasm and I would very much like to be able to create a similar system here. I have ascertained that there is a Pacific INTELSAT satellite located pretty well overhead handling Pacific traffic with television operating on channel 12 in the 3.7

to 4.2 GHz band. Unfortunately here on New Herbrides ther does not exist such a thing as a surplus dish and in this little country I would have to have a go at making one. Could you possibly advise of somebody capable of supplying a low noise preamp and downconverter to say 500 MHz; and what the cost would be? My knowledge of microwave technology is virtually non-existent so please forgive my ignorance. I am willing to learn however and any groups of experimenters that you could recommend would be greatly appreciated here.

Peter Duddy (YJ8PD)
Port Vila
New Herbrides, Oceania

We recently helped a chap in New Guinea get his terminal started and there is now a small but growing group of enthusiasts scattered throughout the Pacific. There are two **INTELSAT birds sitting above approximately 180 degrees west. Like all INTELSATs they carry 'occasional traffic'. However, in the near future the Australians will start operating a fulltime** (probably 12-15 hours per day) **transponder on one of these INTELSAT birds which will be used as a relay for Australian TV service on a regular, scheduled basis. One source** (which we cannot confirm at this time) **suggests that this Australian** (ABC) **programming will have its aural subcarrier with the video on the same transponder as a way of making the Australian receive terminals** (about 50 initially) **less complex. This Australian use of INTELSAT is preparatory to a pair of Australian satellites that will possibly go into operation around 1984. In New Herbrides you might even get some useable signal from the Indonesian Palapa birds** (at 77 and 83 east) **as well as one or more of the Russian birds. Truly, it is difficult to escape to a spot where you cannot find satellite TV available these days!**

WALL CHARTS STILL AVAILABLE

Would it be possible for us to obtain two copies of the Worldwide Communication Satellites Data Chart of Facts, Figures and Operational Standards? We have one copy and have found it to be very informative.

Jim McDonough
Product Manager
VARIAN
Santa Clara, Ca 95050

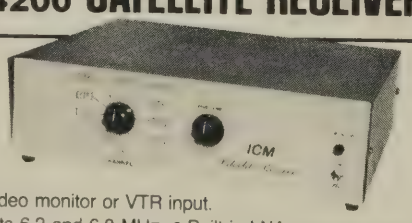
The STT Wall Chart is in its umpteenth reprinting. Price is $10.00 per chart. The chart measures 22 by 35 inches, printed both sides [that's why many people order a pair], four colors and is loaded with the locations and operational data for all of the world's geostationary [TV carriage] satellite systems. Write STT,. P. O. Box G, Arcadia, OK 73007. Send money with order; no billing.

YOU'RE WELCOME

I am presently gathering parts and information for my satellite TVRO system. Most of what I have accumulated has been through Satellite Television Technology publications to which I will owe my sustem's success.

NEW ICM TV-4200 SATELLITE RECEIVER

Provides You With These Features For $1,995



- Output levels compatible with video monitor or VTR input.
- Dual Audio Outputs 6.2 and 6.8 MHz. • Built in LNA power supply
- Tunable Satellite channels 3.7-4.2 GHz.

International Crystal Mfg. Co., Inc.
10 N. Lee Oklahoma City, Ok. 73102 405/236-3741 ICM

Upon completion of my system I would to be able to tune in **Coop's Satellite Magazine Program** on transponder 21. I hereby make a request for written permission to receive my first satellite TV signal, your one hour Satellite Magazine weekly show. Thank you for everything.

Henry R. Hobson
Harwick, PA 15049

I would like to obtain your permission to receive your weekly program "**Coop's Satellite Magazine**" via satellite.

Dr. Dean L. Cook
South Bend, IN 46614

STT continues to grant written permission to anyone who writes and requests same. Under FCC rules you no longer need any type of FCC permission or license to construct **a TVRO terminal for your own private use. You** DO **need the written permission of at least** one **programmer or program source on the satellite and recent issues of** CSD **have listed such sources** (see November 1979 issue). **Satellite Magazine is transmitted on SPN's transponder 21 every Thursday at 12 noon eastern time and lasts one hour. We will be making noticeable improvements in the program content and production quality about the time you read this. And highlights of** SPTS '80 **held last month in Miami will be included in the program for several months to come. We hope we saw you in Miami but if we did not you can see what happened there on the tube!**

PUBLIC SERVICE?

The Digest format is great and should help all the pioneers in this changing technology. I am completing final phases of my Howard Terminal as well as my own design for a 12 foot aluminum dish. As far as the LNA is concerned, I am waiting for a progress report on the Taylor Howard / DEXCEL do-it-yourself GaAs-FET LNA project or possibly the Coleman GaAs-FET LNA. In your November issue you mentioned the possible scrambling of HBO and SHOWTIME type services. I hope this is not the route these companies will take as they could actually increase their business by supplying to private terminals in rural areas where cable TV is not available and will not be available in the forseeable future. These companies could perform a public service as well as realize a significant increase in their income. I am a positive minded person and prefer to believe that most people possessing private terminals are honest and will pay a fee for these services. Like most pioneers in this new technology I am interested in the educational aspects of TVRO private terminals rather than the entertainment value. However, I am anxious to pay for these services since my family enjoys TV and we do live in a rural area away from Cable TV. I hope that HOMESAT and STARSCAN are successful in their efforts to legally make HBO and SHOWTIME type services available to private terminals for a reasonable fee.

Larry Wilson (Engineer)
90 South Belmar Drive SW
Reynoldsburg, Oh 43068

Well, since November's CSD very little has changed to make the prospects for legal, reasonable-fee, home service from SHOWTIME or HBO available. Keep in mind that The Movie Channel (formerly STAR CHANNEL) **is available at $96 per year for its new 24 hour per day service. That works out to $8.00 per month** (although paid in advance) **and if you and your family catch** one **good movie a month on the service which you would have gone into town to see in a theater, you've gotten your 8 bucks worth. If you catch two in a month, you are money ahead and can start to retire** (on paper) **some of the 'debt' of the TVRO!**

AUDIO ONLY

I would like to receive the American Forces Radio Service here in Panama; I am aware they are broadcasting this to our area via satellite as the local station always mentions that news

events and sports are carried to Panama via satellite. I would like to release myself from their local station as they are now not carrying the sporting events because they now transmit these via satellite to the TV system here. It seems to me that radio only reception equipment for reception of the satellite system should be much less expensive than a full TVRO terminal. Can you help me find a reasonable design to allow me to receive these audio-only transmissions?

Eugene Sasso Maduro
Panama, Panama

One of the big mysteries to us is via-what-bird the AFRTS station[s] in Panama [and elsewhere] are receiving their television [and audio] feeds. RCA has a contract to design an AFRTS system for world-wide coverage of American television [and radio] programs to U.S. bases overseas and the first part of the project calls for delivery of U.S. programming to places such as Panama, Guantanamo Bay [Cuba], Roosevelt Roads [Puerto Rico] and throughout Alaska. Yet Panama has apparently been receiving U.S. TV programming via satellite for a couple of years now although we are not aware of any program feeds on the existing [and visible] SATCOM, WESTAR or COMSTAR birds which seem to fit this pattern. Is it possible the U.S. Forces in Panama are receiving their U.S. radio and television via a military satellite (operating in the 8 GHz up and 7 GHz down band)? **If so, what a curious use for a military satellite! Perhaps there is a reader out there who knows something about this and is willing to enlighten us all.**

HOLY COW!

Please rush me information about: (1)Coop's Satellite Digest, what it costs and how to subscribe, (2)a list of all of your available STT VHS tapes which describe satellite TV system design and operation, and (3)a good source for quality X-Rated VHS tapes.

J. Jackson
Missouri

STT has been supplying VHS (and BETA - we care not which) **tapes that tell all about private terminal construction and operation for some 15 months now. We are right in the midst of re-producing our masters for virtually all of the tapes since we have recognized from the beginning that our original tapes offered were done in an amateurish way. We recently went way into hock** (Susan says too far into hock) **to install a first class production and editing system and Coop now spends more time in the tape room** (once upon a time it was the living room!) **than he does banging away at the typewriter. We'll have completely re-edited and much improved VHS and BETA format tapes available by April plus a whole new series of lower cost tapes. None will be X-rated** (we do have this great out take on one of the original masters done at Tay Howards where he describes, vividly, how his father used to help the neighbor 'water' his lawn but in today's society that brief excerpt probably wouldn't even rate a PG classification!).

SOUTH AFRICAN TVRO?

I have followed with great interest the series of articles describing direct satellite reception in the 3.7 to 4.2 GHz region but unfortunately have been unable to acquire much information about equipment available from here in South Africa. Would it be possible for me to receive satellite TV in the Johannesburg area? Which signals could I receive?

Where could I purchase a suitable parabolic antenna, LNA and receiver for this service?

I. Wagner
I. Wagner Engineering
P. O. Box 6642
Johannesburg 2000
South Africa

Every week we receive many letters from people scattered about the globe who have learned that international TV reception of a high quality is possible via satellites. Every area of the globe has different reception possibilities. In South Africa the best bets would be the INTELSAT satellites sitting over the western tip of Africa (above the Atlantic), **the INTELSAT birds resting over the Indian Ocean, and, one or more of the Russian satellites. All INTELSAT reception requires bigger antennas than are normally required for DOMSAT** (domestic satellites) **reception plus the willingness to view programming relayed either in native** (and usually foreign to your own) **tongues, and/or relayed as program segments rather than as full broadcast days. At the present time most INTELSAT reception involves twin receivers since in many cases the audio channel for the video is transmitted not as a subcarrier but rather as a SCPC** (single carrier per channel) **signal, often on a totally different transponder from the video. Probably within a year or two the audio for INTELSAT fed channels will join the video on a subcarrier but for now that is not the** common **approach. As far as finding equipment...virtually every issue of CSD lists numerous sources.**

UPGRADE AND RUSSIANS

Per the notice in the January **CSD** please upgrade my subscription to include both the technical and programming sections. Frankly it is not so much that I have become 'attached' (as you suggest) to both sections but rather with the little tidbits about scrambling, LNA cooling and so on that pop up in the programming section I thought I'd better take both.

I found the article about the Russian satellites interesting but of academic value only. Although there is some pleasure to be derived from successfully receiving those transmissions, few of us are fluent in Russian. I **would** appreciate any information available on receiving English/British TV via satellite. Having spent some time in Britain I can testify that their television is well worth receiving.

Daniel J. Ramer
Kinnelon, NJ 07405

Around 1-reader-in-8 receives only a single section [i.e. technical or programming] and 90% of these elect the technical section. When we send out samples we mail out a full Digest to show people what the complete edition contains. Anyone who wants to upgrade can do so for $20.00 additional per year (total subscription price is $50 in U.S./Canada/Mexico; $75 elsewhere **and** the elsewheres go via airmail). **Time-Life is planning to introduce 6 hours per day from British TV** (primarily BBC) **around 1 April; we suspect it will be on transponder 20, evenings. Cable systems are being charged $.09 per home per month for the service which is really twin feeds of three hours each** (for both coasts) **back to back. We have been** (and will continue to be for awhile anyhow) **'heavy' on Russian satellite data.** Why? **Well, it is a challenge. It also gives us an opportunity to show off something really exotic on an international basis since both Molniya and Statsionar have higher EIRP levels than the INTELSAT birds usually have. By 'upgrading' a private terminal to Russian reception you begin thinking about things like circular polarization** (i.e. the Birkill Hybrid Mode feed), **time-zone adjustments and different audio formats. The satellite TV system of the future probably won't be standardized on one set of technical formats for decades to come so the well equipped terminal will have to be flexible technically. Finally we have hundreds of readers outside the USA/Canada/Mexico chunk of ground who are dependent upon international class birds for their TV.** To them HBO and DOMSATs don't make any sense!

RAMSEY IS OK

I thought it was about time I told you how much I enjoyed SPTS '79 and now **CSD**. Back in '77 I was suggesting building a satellite receiver but I didn't know how and everyone I asked about it said it was impossible for a limited budget. It only took two years for the impossible to become relatively easy! Thanks to SPTS and **CSD** I feel I am witnessing the birth of an important new industry. I also find the Sunday Satellite Ham Net very informative and although I have never found time to get my ham radio 'ticket' I am listening every Sunday and when I do have a questions I call Jim Keeth (AF9A) who is here locally and who checks in each Sunday. Jim and I work together

at RCA and have been collaborating on our satellite receiver. Our progress has been slow but deliberate and that isn't all bad since we are not yet locked into some outmoded technology.

I was very excited to hear about the new Washburn Receiver (Manual) and the fact that circuit boards, parts kits or full units will be available from Ramsey Electronics. I have dealt with Ramsey before and found them to be honest. I bought a frequency counter kit from them which had two bad ICs. They replaced them promptly when I called and that was a nice bit of concern to me.

Lastly I am enclosing a printout of antenna aiming parameters for your **CSD** location. I am willing to make these printouts available to anyone for one (US) dollar plus a (US) stamped and self addressed envelope (standard number 10 business size).

Ronald Waltner
353 N. Kenyon
Indianapolis, IN 46219

We too believe the relationship with Ramsey Electronics will be a healthy one for this newly emerging industry. Frankly the reaction to the Washburn Receiver (and manual) **at SPTS '80/Miami was so outstanding that we can see Ramsey having some possible delivery problems with everything but circuit boards for awhile. The crowds at the Ramsey booth were so thick you could hardly get through most times! Waltner's Geostationary Bearings antenna pointing chart is a good one and we suggest that anyone looking for antenna azimuth, elevation and ranging data on the SATCOM, WESTAR, STATSIONAR, ANIK or COMSTAR birds drop a dollar** (with an envelope as suggested, pre-stamped) **to Ron for a copy. Provide your own geographic coordinates to the nearest ten minutes or so of course.**

BIRD OPERATIONAL NOTES

WESTERN UNION, in a move similar to that taken by RCA 18 months ago, auctioned off a group of WESTAR transponders (seven in all). Takers included ABC, CBS, Hughes TV Network, Bonneville Broadcasting, SIN, Video Communications Inc., Robert Wold, Cable News Network and SCN.

Two commercial-syndicated program users of satellite aimed at distributing programs to major market TV stations are scheduled for satellite start on WESTAR this fall. **Blairsat** and **Vidsat** expect to be beaming shorts, commercials and specials into around 50 combined markets by the end of 1980.

RCA's SMARTS system, designed as their answer to getting every TV station in the country to 'go satellite' meanwhile will begin transmissions this month on a test basis. Only a handful (four) of the stations are involved but it is a start.

FCC approval allowing PBS's 148 downlinks and 5 uplinks to be shared with Western Union is expected to have major impact on transmission of broadcast programs to commercial stations across country. PBS system is already in place and approval will mean many new 'shared' users.

Not all private terminal operators are going non-license route. FCC released data for January shows a James M. Barker of Hamburg, Arkansas as recent applicant for a private - licensed terminal. AFC (Microdyne) provided the hardware according to FCC. PTL meanwhile recently reported it has 15 private terminal systems viewing its program; at least that's what their internal records show!

Market for 1980 earth terminals continues to be subject for predictions. Even discounting **any** private terminal sales AFC's Howard Hubbard sees 1,500 to 2,000 terminals being installed in US during 1980. AFC will announce a new 3.7 meter $3,000 antenna shortly; their 7 meter antenna is reported to be producing 10.5 to 11 dB CNR measurements at private terminals in the Bahamas with 120 degree LNA and Microdyne 24 channel radios; from SATCOM FI.

WESTAR IV contract, for a 24 channel bird, reportedly has gone to Hughes. Bird will be similar to SBS, Telesat Canada and Palapa.

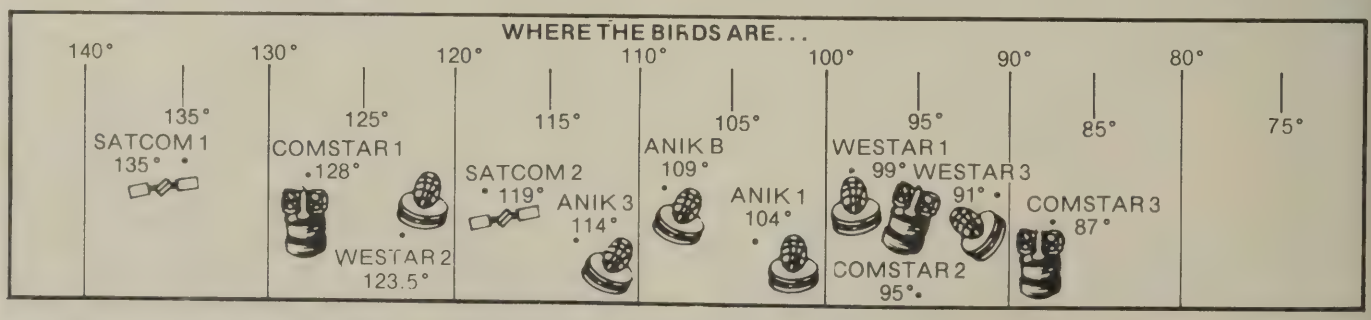
Nevada hotels and casinos continue to be big buyers of terminals although market may be approaching saturation. Most are going license route; FCC granted three in one recent week.

RCA received expected waiver to proceed 'with haste' on construction of FIV bird; to replace FIII lost in space.

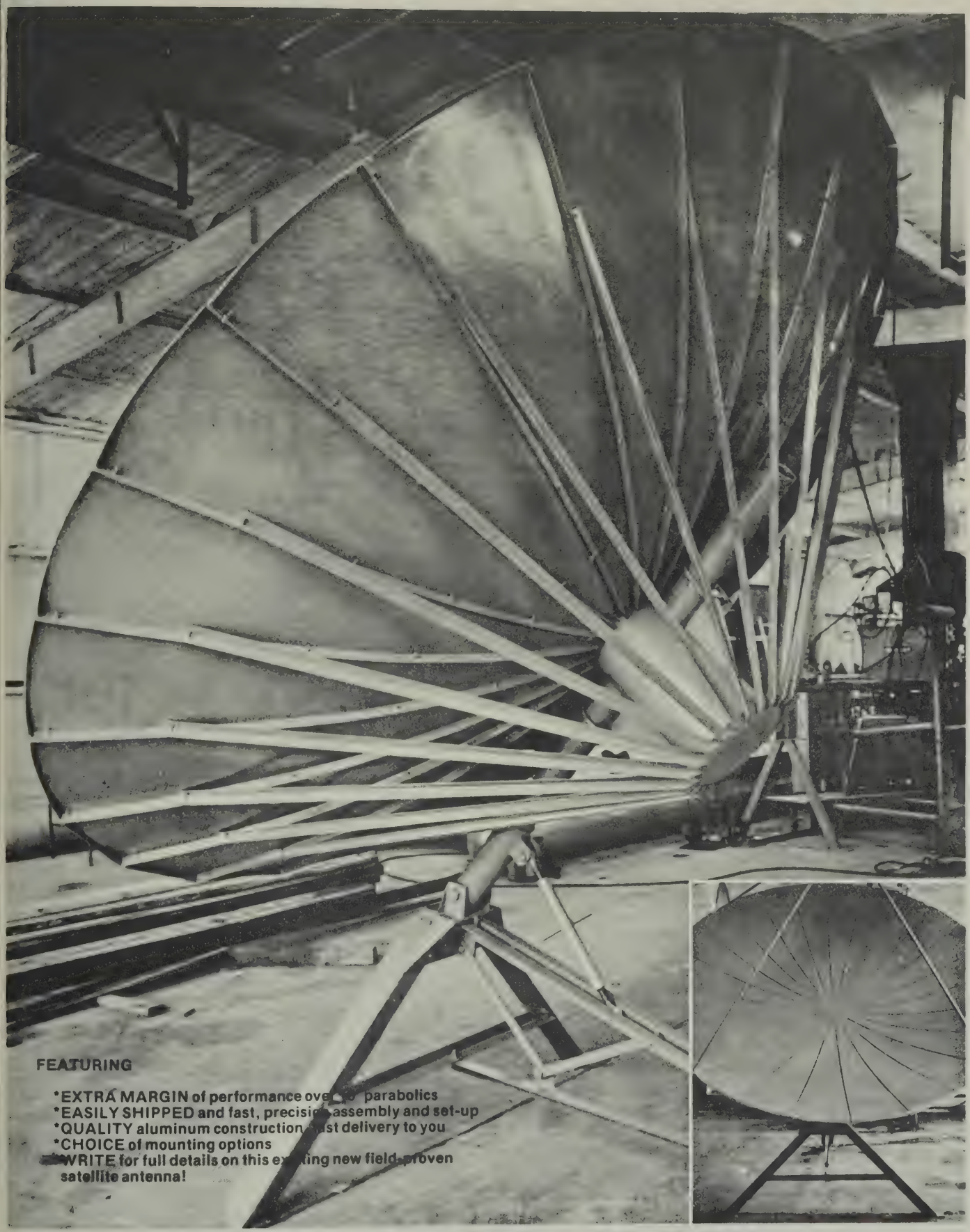
BBC programming scheduled to start around 1 April on SATCOM FI transponder 20 is attracting wide interest. Schedule calls for 42 hours per week, six per day, with twin feed of three hours each (back to back) for east and west coast viewers. Programming will repeat with 12 new hours each **week** out of 42 with new programming introduced on Monday, Wednesday, Friday and Saturday. Cable systems will now pay 9 cents per home per month with discounts. Programming will start at 7 PM daily for east and re-start at 7 PM pacific for west.

RCA hoping to restructure failed SATCOM FIII network by placing some new cable program suppliers on FII (119 degrees west; see **CSD** for February) as early as this month. RCA plans to move some of their data and message traffic off to COMSTAR birds on sub-let basis. Most likely FII transponders to watch for signs of new cable programming during March-April period will be: **2, 4, 5, 6, 8, 9, 10,** 13, 14, **16,** 17, 18, **20,** 21, **22** and **24**. The most probable to be used (first) are in bold face. Yes, those are all horizontally polarized.

Want to transmit internationally? You can now purchase a combined audio and video feed of ten minutes duration from INTELSAT for $168.50 provided you 'hand' feed to uplink and take service at downlink yourself. If the rates keep dropping we may be able to hold a truly international SPTS one year soon with participants from all six continents 'checking in'!



INTRODUCING: ADM's ELEVEN FOOT SATELLITE ANTENNA



FEATURING

*EXTRA MARGIN of performance over solid parabolics
*EASILY SHIPPED and fast, precision assembly and set-up
*QUALITY aluminum construction, fast delivery to you
*CHOICE of mounting options
*WRITE for full details on this exciting new field-proven satellite antenna!

ANTENNA DEVELOPMENT AND MANUFACTURING, INC.
2745 Bedoll Av., P. O. Box 1178, Poplar Bluff, Mo. 63901
Telephone (314)785-5988

Progress Report:

WASHBURN TVRO RECEIVER at SPTS '80 MIAMI

SPTS '80 MIAMI had so many exciting technology innovations it would be difficult to label any single item as the ''Hit of the Show''. The introduction of the new Washburn High Performance TVRO Receiver came close to ''stealing'' the show however. For those who missed this exciting new receiver in Miami here are some frequently asked questions which may help you make up your mind as to whether your new TVRO terminal should be built around the Washburn Receiver (manual).

1]TEST EQUIPMENT - What type will you need to duplicate the high performance receiver? Remember you can build some modules on your own and acquire more complex modules already built and tested from Ramsey Electronics, or build it all yourself (circuit board layouts are in the manual; boards are available from Ramsey Electronics). If you build it all, you'll need 70 MHz sweep and marker equipment, a signal generator (to 300 MHz in a pinch, 1,000 MHz is better), a frequency counter (300 MHz in a pinch, 1,000 MHz is better again), a DVM(digital voltmeter), Hi-Z voltmeter, RF detector probe, a scope (usually found with the 70 MHz sweep / detector system) and an accurate ohmeter.

2]SENSITIVITY - Yes, the unique threshold extension design does allow you to reduce the antenna/LNA requirements. The Washburn Manual from STT explains in great detail how you select your LNA and antenna (size) based upon three different levels of service you can select (from home-quality through professional quality). In many situations a ten foot reflector with a 120 degree LNA and the Washburn Receiver **will** get you home quality pictures where a much larger antenna (14 foot or larger) would be required with a receiver that does **not have** the threshold extension feature.

3]OFF SHORE USE - Yes, provisions are included in the manual for operation from 220 VAC mains. You can order the system wired and tested for CCITT audio formats and non-DOMSAT aural subcarriers (the manual shows you how to cover from 5.6 to 7.4 MHz subcarriers). AND - the threshold extension feature becomes VERY important in weak signal areas.

4]BUY SOME/BUILD SOME - If you feel uncomfortable working above 100 MHz, or lack test equipment for same, you can elect to buy individual modules operating above the low (70 MHz) IF wired and tested and then complete the power supply, 70 MHz IF and demod, cabinet and VCR interface (modulator) plus feed rotational control system on your own.

STT's brand new ''**Washburn [High Performance] TVRO Receiver Manual**'' is our most outstanding manual to date. Over 50 pages, large fold-out schematics, parts assembly drawings and detailed construction and alignment instructions. **PLUS** - each purchaser of the STT Washburn Manual receives **a 10% discount** when ordering either the full circuit board set, or the full kit, or a wired and tested receiver from Ramsey Electronics!

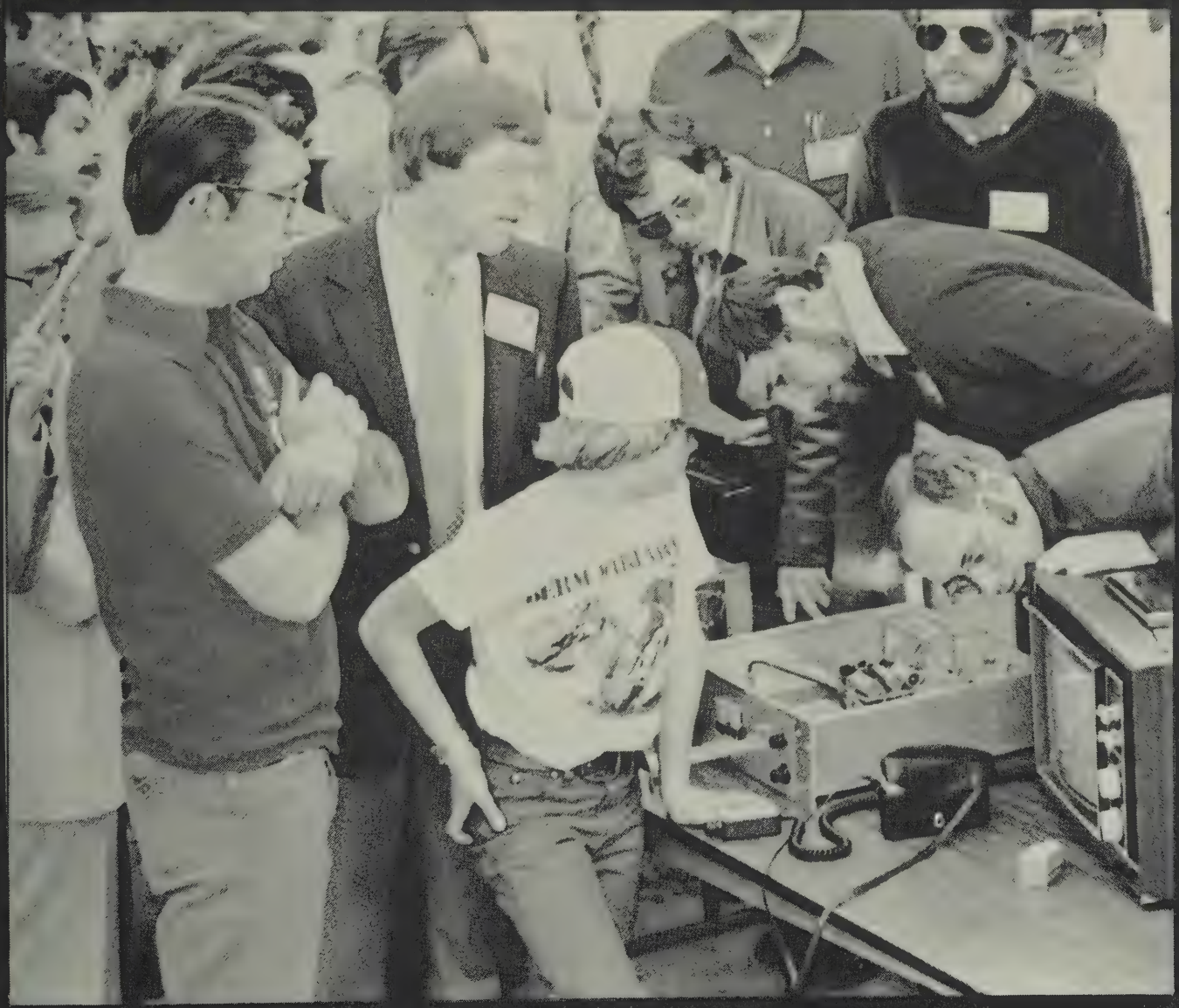
To order your STT Washburn Manual, use order card in this issue of CSD [colored blue] or send $40.00 [$45 outside of USA, Canada, Mexico; always in US funds please!] to: SATELLITE TELEVISION TECHNOLOGY • P. O. Box G • Arcadia, OK 73007

INSIDE THIS ISSUE

Improving Picture Performance
SOME NEW PLL TRICKS
Audio From Molniya
PWM AUDIO RECOVERY
A Whole New World
RE-EVALUATING INTELSAT
Expanded Cable Services
FI + D2 = MORE TV

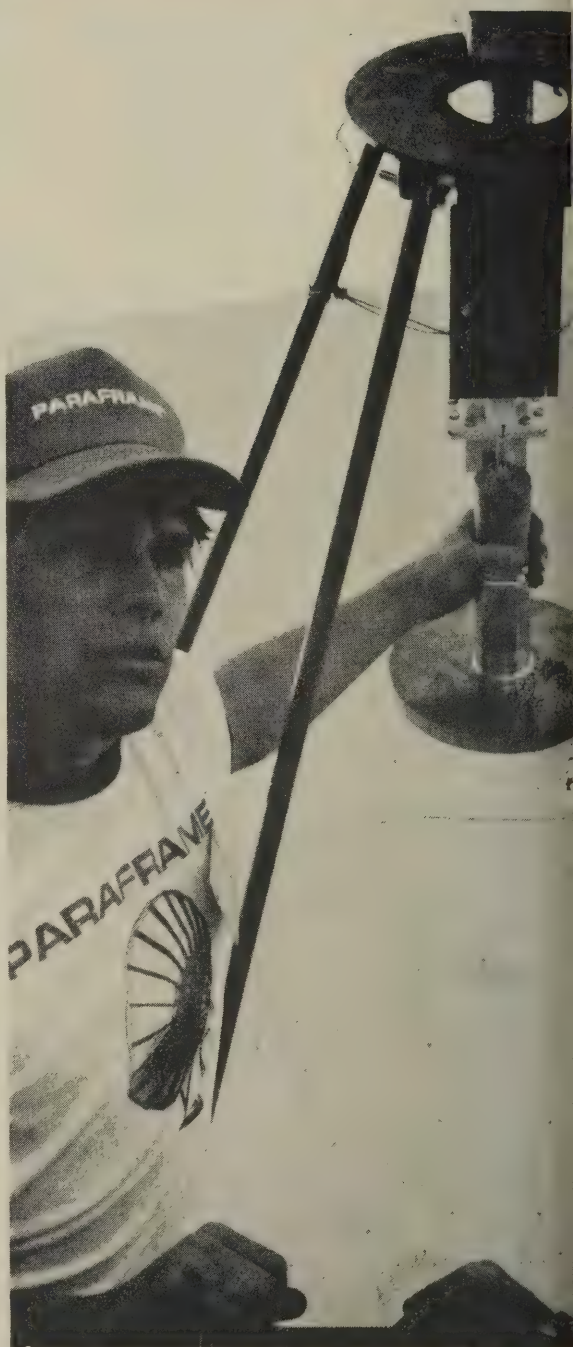
COOP'S SATELLITE DIGEST

APRIL 1980



AWESTRUCK BY INTELSAT - The first public display of INTELSAT reception on a small [4 meter] antenna draws an intense SPTS crowd bunched around a Sony monitor fed by an AVCOM receiver. "MY GOD - that's a soccer match from BRAZIL!!!"

PARAFRAME



TELSAT. If you are planning to work with EIRPs as low as INTELSAT's 26
w hemispheric beam, you need the high precision, structural strength and
an-gain of a BIG ONE from Paraframe. At Paraframe we do the big jobs
ery day; 12 foot, 15.9 foot and soon 24 foot high performance parabolas.
TELSAT. The real test of a small system private terminal. At Miami's
TS '80 the big ET/4.85 (15.9') high-precision parabolic by Paraframe
livered the impossible; Sao Paulo, Brazil via Intelsat IV-A (FI) parked over
e Atlantic at 24.5 degrees west!

FESTIVAL 15 ANOS

INTELSAT IV-A (FI)/Sao Paulo/At SPTS'

PARAFRAME

1000 Sunset Drive West / P.O. Box 423 • Monee, IL 6
[312/534-7435]

COOP'S SATELLITE DIGEST T1-4/80

COOP'S COMMENT ON TECHNOLOGY

SPTS '80 CALIFORNIA

While it may not be apparent to the casual observer, there has been an attempt on our part to 'package' the SPTS events to suit the locale where they are held and the mood of the industry at that point in time. The technical and non-technical sessions, for example, are kept 'fluid' right up to the last ten days or so to insure that we have the latest developments and technology on the program.

SPTS '80/California is now firmly set on the calendar. The dates are July 4, 5 and 6; a Friday, Saturday and Sunday. Yes, that is over a holiday period and we think this is smart since it will allow more people to get away and attend.

SPTS '80/California is being held in San Jose, California which for the unwashed is deep in the heart of something insiders call 'Silicon Valley'. The Sunnyvale/Santa Clara/San Jose portion of the southern San Francisco Bay houses a very high percentage of the nation's high technology (i.e. space electronics) firms and we suspect that you could get yourself a tour or two of some of these facilities just before or after SPTS '80 if you played your cards right.

Now to show that Susan and I **do listen** to your comments, suggestions and complaints here is how SPTS '80/California will adapt to the location, the timing of the event and the spirit of SPTS.

1) The location for everything is the San Jose Hyatt House. This is less than 5 minutes from the San Jose Airport (which is easy to get into and out of from almost anyplace) and if you insist on coming in from San Francisco's larger airport, a 40 minute or so drive straight down the Bayshore freeway.
2) The Hyatt House's main facility will seat 1,000 people; which we'll split up between parallel high-technology and low-technology/management/equipment sessions.
3) The physical layout of the Hyatt House offers us a unique opportunity to do everything at one spot. A large central Japanese garden is surrounded by lodging facilities and we will have the booths within the garden area (many will be outside!); at least one antenna will be 'poolside' and you'll move from booth to booth by walking through the garden (now that's California for you!).
4) We always videotape the presentations. **THIS** time we'll take the day's videotapes and run them back through the Hyatt's MATV system so you can **sit in your room** in the evenings and watch (or re-attend) the day's events. **YES** - you **can bring** your own VCR machine, set it up in your Hyatt House room and videotape the proceedings to take back home with you! This way you can attend both the technical and not so technical sessions every day; one program in person, the other on tape!
5) The heavy sessions will be on Friday the 4th and Sunday the 6th (we'll be done at 3 PM on the 6th). Since essentially the whole facility will be 'ours' for the holiday weekend, we can operate with hours and scheduling that might disturb others; such as well into the evening periods. Saturday the 5th will be Exhibit Day and for the most part this will be your opportunity to really get acquainted with the suppliers and their gear.
6) This will be an informal affair, ties and suits (in respect to the California life style) are definitely out. We'll even let you into sessions wearing a swimming suit (provided you have your badge on or with you).

The family. The San Jose area has numerous nifty attractions including Marriott's Great America Theme Park (ten minutes from the Hyatt) and Frontier Village. The Santa Cruz beach and boardwalk is nearby. There is no shortage of attractions for the family while the 'old man' soaks up the latest in satellite technology.

We recall that the SPTS '79 in Oklahoma last August sold out weeks in advance. Interest in the San Jose SPTS is so high that we expect two things to happen within a short period of time. **First**, the booth space for exhibitors (there is only so much available) will disappear very rapidly. We've made a mailing to the exhibitors already and if you want to exhibit but didn't get an announcement from us you'd better get back to us pronto; many of the best spots are already gone. **Second**, although the Hyatt House has 500 sleeping rooms we expect them to disappear rapidly since staying there will assure you of being in the thick of the action, plus, give you direct access to the televised events through the MATV system in the facility. **Don't contact the Hyatt directly however**; we have special registration cards that we return to you with confirmation of your registration that not only gets you in but also gets you a break in rates ($36 single/$38 double; compare that to Miami!)

Check your calendar and make your plans now. Use the registration card in this issue of CSD. Today. **Now.**

OUR COVER-

As the first hint of INTELSAT from Brazil climbs through the sparklies a moment of silence falls over the SPTS '80/Miami crowd.

CSD TECHNOLOGY

COOP'S SATELLITE DIGEST (Technology Section) is produced monthly by Satellite Television Technology, P. O. Box G, Arcadia, Oklahoma 73007 (USA); 405-396-2574. **CSD** is not affiliated with any satellite programming source, hardware (equipment) manufacturer or distributor, nor satellite systems operator. STT does produce a weekly television program called **Satellite Magazine** which is distributed free of charge to viewers via RCA SATCOM FI at 12 noon eastern, Thursdays on (SPN) transponder 21. Subscription rates to **CSD** are $50 per year for US, Canada an Mexico delivery; $75 per year outside (all via first-class/airmail). All subscriptions must be paid in advance; no invoicing. Contents copyright 1980 © by Satellite Television Technology.

LEARN BY DOING NEW PLL TRICKS

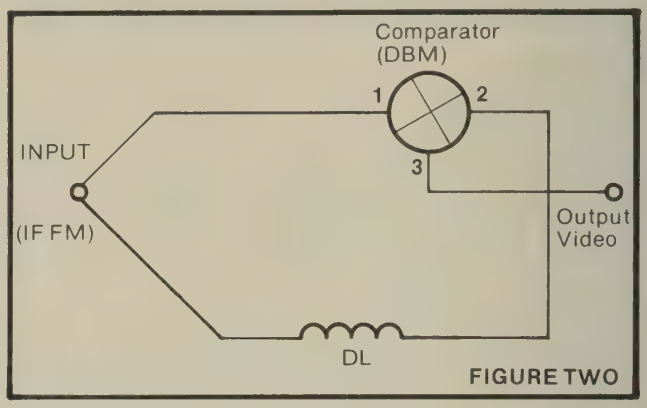


FIGURE TWO

THE PLL DISCRIMINATOR GOODIE

The utilization of the Phase Lock Loop, primarily the NE561 and NE564 to date, has been abundantly described by Tay Howard and Steve Birkill in both manuals and here in **CSD**. The Probability that not all of the tricks of the PLL, as an FM detection system, are known to mankind has prompted Canadian research engineer Jan Spisar to investigate further methods of improving the sensitivity and stability of these popular devices.

While the introduction of the Washburn Manual with its clever use of Plessey PLL devices suggests that there are still engineering tricks to be played effectively with the Plessey devices, the mainstay of most PLL circuits in North America remains the NE561 and 564 devices. There are rumors that the 561 may be dropped from the line sometime soon leaving the 564 as the 'winner device' in this series. The primary difference between the two is the upper frequency limit, which is higher with the 564.

Spisar brings to his PLL experiments a wide and successful background in the design of high quality CATV amplifiers, modulators, demodulators and other devices for several manufacturers of CATV hardware in Canada and elsewhere. As a TVRO experimenter Spisar has developed several different low-cost receiver formats and is currently working on a single downconverter-multiple (two or more) demodulator system wherein separate portions of a house can independently tune-in separate transponders (it was inevitable that the single-receiver-per terminal format for even private use would not linger with us long!).

As Spisar notes "The principle circuitry blocks included in the PLL chip are the signal comparator and the voltage controlled oscillator. Two signal inputs are required to activate the signal comparator; one of these signals is the 70 MHz FM TV signal fed in to the circuit from the 70 MHz IF amplifier stage preceding the demodulator. The second required signal is supplied by the internal VCO in the PLL. The basic operating

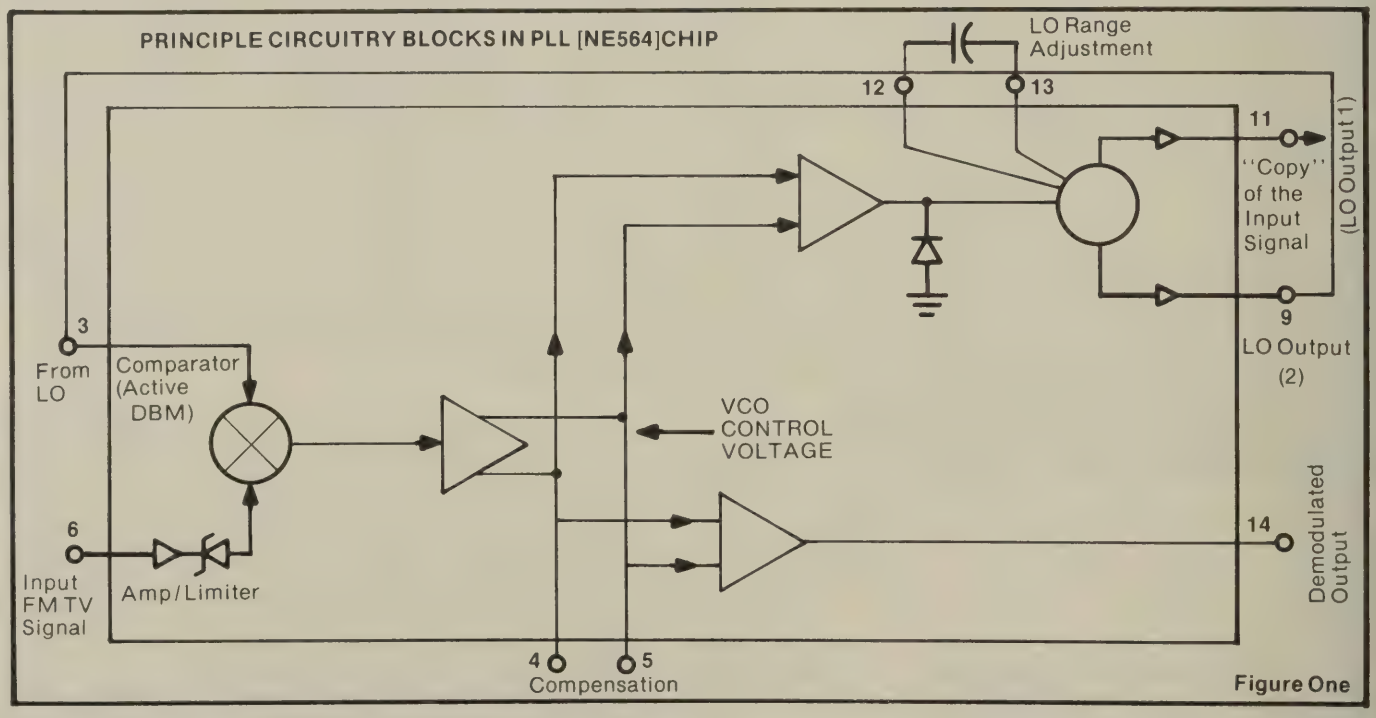


Figure One

frequency of the PLL oscillator is adjustable by placing a small pF variable capacitor across pins 2 and 3 of the NE561 or across pins 12 and 13 of the NE564."

The output of the comparator is a voltage (on pins 4 and 5 of the NE564) which expresses the direction and magnitude of

Material Submitted by:
Jan Spisar
Spisar Engineering Ltd.
3732 Baywater Cr.
Mississauga, Ontario

SENSITIVE DISCRIMINATOR WITH ACTIVE DBM

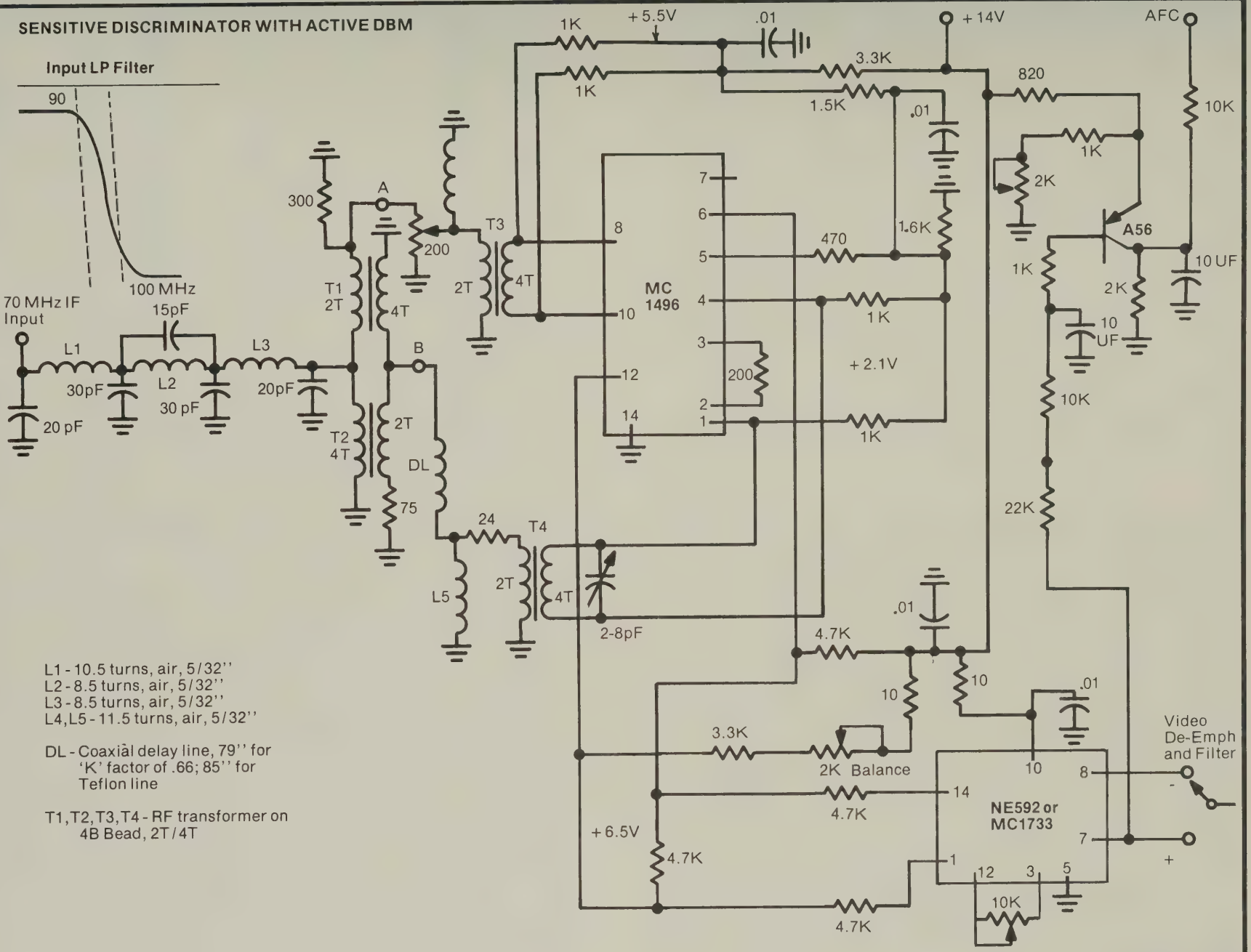


Figure Three

frequency adjustment of the local VCO which is necessary to make the comparator "happy". And the comparator is "happy" only when both input signals are exactly equal in frequency and phase. Spisar notes "The equality of phase is not quite true as there would be no output from the comparator to push or pull the VCO if there was no error in phase. **The output voltage of the comparator is therefore proportional to the frequency deviation of the input signal** (at 70 MHz) **which has to be followed by the VCO and actually represents the video** (and audio) **modulation**".

The input signal is not **perfect** under any but laboratory conditions; that is, there is **some** noise and **some** distortion present. The signal generated by the local VCO is however very stable in amplitude and a "sample" of this signal is almost a perfect "copy" of the input FM TV signal. Hence the output of the VCO is a perfectly amplitude limited (input) signal. And as Jan points out "This is not bad for a device that costs around $3.50!".

All of the amplitude related noise of the input FM TV signal is gone at this point (some is converted into phase noise at the output of the VCO however). When this signal is fed into a simple discriminator (**see figure two**) Spisar reports he is obtaining improved video S/N (signal to noise) performance than he can achieve with the direct PLL demodulator.

One approach to this technique is shown in **figures two and three**. In figure two Spisar explains "The signal applied to the double balanced mixer at port 1 has negligible phase shift with frequency. The signal at port 2 has phase related to frequency (for each 1 nanosecond of electrical length of delay line the phase will change by 3.6° and for a full voltage swing at the output of the DBM the delay line will be selected to provide some + /-25° for + /-10 MHz).

The delay line length is selected to provide 25° of shift at the center frequency (typically 70 MHz). For a steeper S-curve delay a line of 270° length could be utilized.

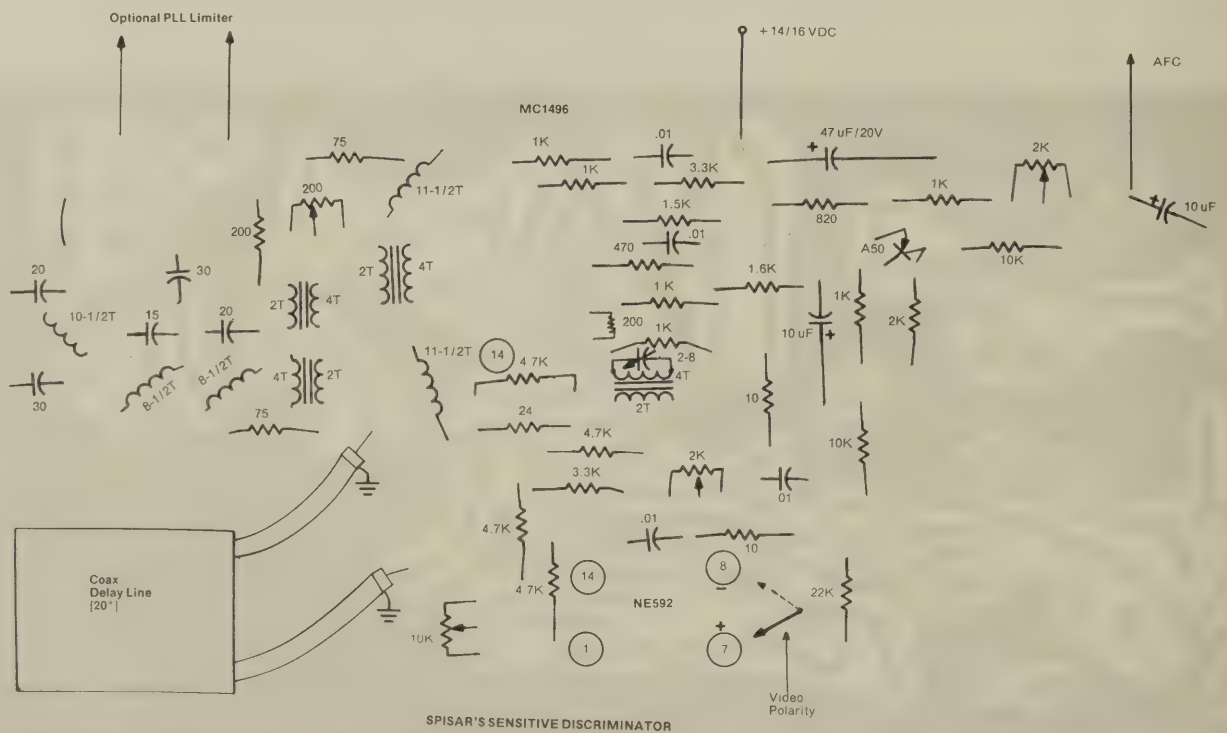
A straight passive DBM would require a very high level IF signal (in the 2 volt range) and a carefully designed IF amplifier with limiter. Additionally, good linearity would be required.

A much more sensitive discriminator using an active DBM/multiplier such as the MC 1496 was designed to circumvent this problem. The result is shown in **figure three**; an experimental (but fine working) approach to this problem. The required frequency shift between pins 1 and 8 can be obtained with either a delay line in one pin (port) or by L/C networks in each port.

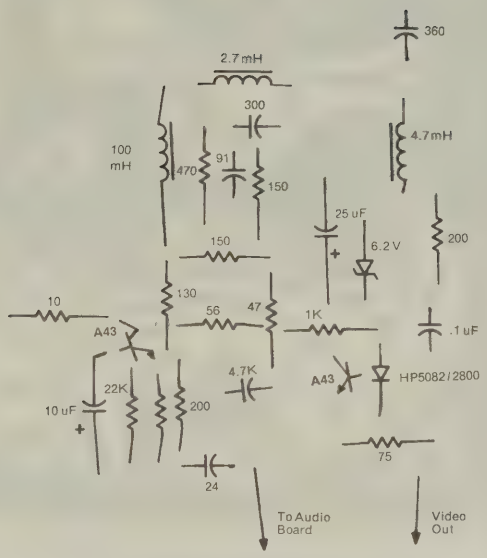
In figure three an input signal from an IF (bandpass) filter with one stage of limiting is applied to the discriminator through a low-pass filter (with a roll off frequency of 90 MHz) and through a 6 dB directional coupler (T1, T2). The level required is that compatible with the popular Howard/Shuch design receivers. A higher level signal is applied to pins 8 and 10 of the MC 1496 via a transformer. A portion of the signal from the directional coupled port B is applied via the delay line or phase shifting L/C network to the "signal" terminals of the MC1496; pins 1 and 4. The bias distribution on the 1496 is quite critical and the indicated voltages in figure three represent the optimum bias distribution. The demodulated signal is available at the output terminals (6 and 12) and is strong enough that it has to be attenuated (4.7K resistor) and applied via 4.7K resistors to the input of the NE592. Spisar notes "Actually more than + /- 0.5 volt is available from the MC1496 and the NE592 is utilized primarily for convenience. The AFC voltage is balanced by a 2K pot in the emitter divider of the A56 (a low cost PNP transistor)".

The de-emphasis and filter for the video employed by Spisar is very similar to that shown in the Howard Terminal manual. The input signal required to the active DBM demodulator is in the 60 to 100 mV region and the output video is 1V peak to peak. Note the polarity switch.

In conclusion the application of the PLL in this circuit



SPISAR'S SENSITIVE DISCRIMINATOR



VIDEO DE-EMPHASIS AND FILTER
(similar to Howard Terminal)

allows it to function as a 'perfect' signal limiter and a new source of an FM TV signal with reduced noise characteristics. Spisar reports he is now working on additional circuits to separate the noise (or error) signals by combining the sample of the VCO with a sample of the incoming signal, separated by 180° amplitude. At that point perhaps principles of feed-forward correction could be applied to obtain substantial additional noise reduction (i.e. threshold extension).

MORE NOTES ON MOLNIYA RECEPTION

In the Programming Section for the February issue of **CSD** we discussed the inclined orbit twin apogee's of the Molniya series of Russian satelites transmitting a SECAM color picture centered on 3895 MHz; and the unusual fact that the ''western apogee'' directly above North America is the 'active' apogee for transmission of television programming to Orbita ground receiving terminals in the (northern) USSR.

Recovery of Russian video on this frequency is relatively simple, even with NTSC type receiving equipment; provided you are willing to watch the picture in black and white and have no strong urge to also recover the Russian audio. To graduate from a passive black and white viewer to one that is receiving a high quality color signal without visual picture impairments, and, with the accompanying Russian program audio will require some additions to the baseband portion of your receiving terminal.

The Molniya series of inclined orbit birds have a dual apogee each day; one that 'peaks' roughly over Manitoba and another that peaks 12 hours later over the north central USSR directly north of India. This apogee peak point is shifting westward at a rate of 0.15 degrees daily. There is some slight question as to whether the 'published data' or the 'observed data' is correct and only a series of calibrated observations from some North American viewers will settle that question. Suffice to state that until we know differently the western apogee is **either** around 129 degrees west **or** 99 degrees west as of the first week in April. The usable portion of the apogee, some 3 to 4 hours centered on the actual apogee, will find the bird moving only a couple of degrees and when it is stable in azimuth and elevation for approximately 30 minutes time you have just pin pointed the actual apogee point (and you should

Prepared from data supplied by:
Steve J. Birkill
128 Cross House Road
Grenoside, Sheffield
S30 3RX, England

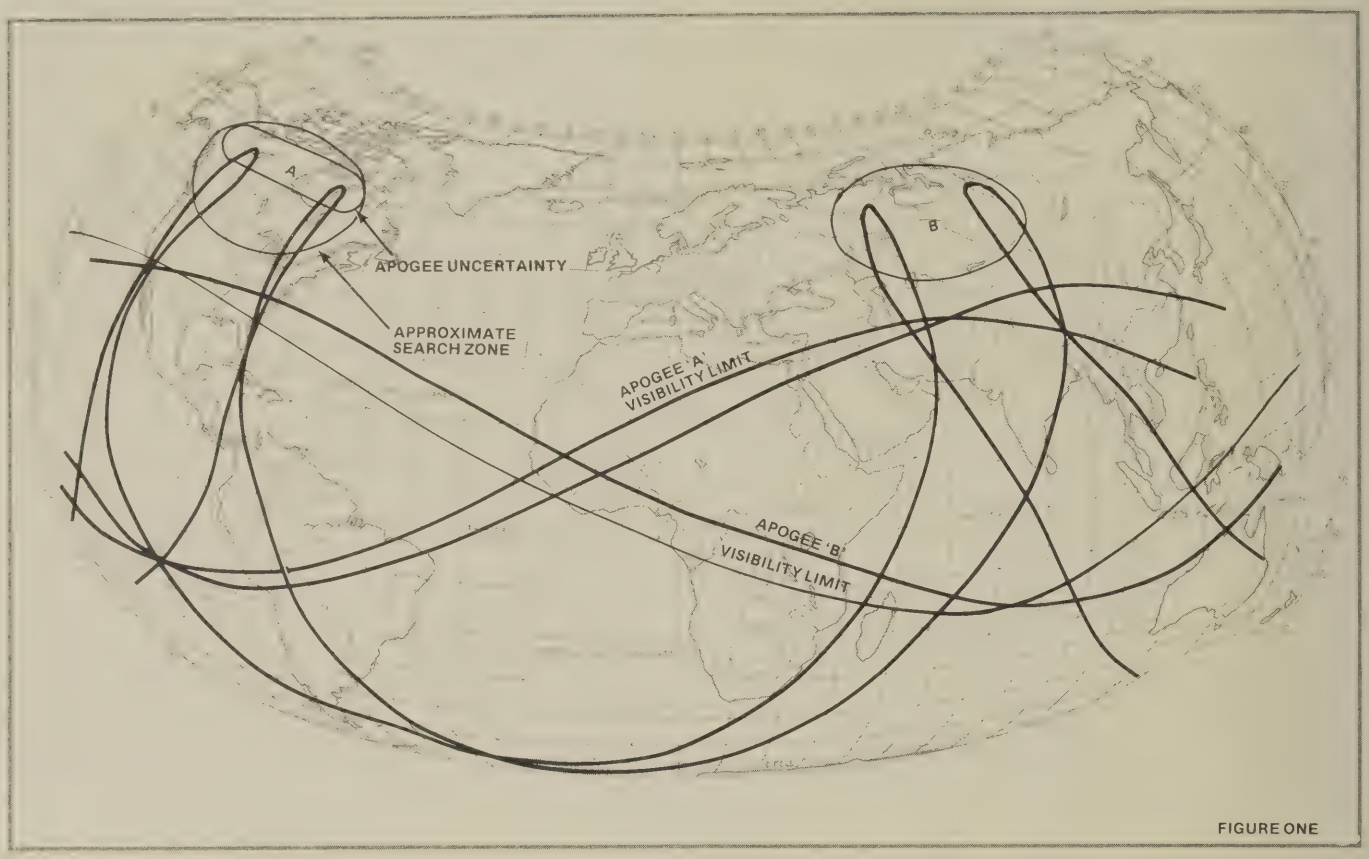


FIGURE ONE

carefully note your apparent heading of elevation and azimuth and report same to **CSD** along with your own coordinates).

Since Molniya series satellites do have a **pair** of apogee periods per day, separated by 180 degrees in longitude and 12 hours time, it might be worthwhile to ponder why the Russians choose to activate these birds with television intended for reception within the USSR when the apogee is over North America versus when the apogee is half way around the world and over Russia. Obviously the choice could go either way, or even both ways. There are several theories on this including:

1)While television transmissions have been observed recently only on the western apogee (A on **figure one**) it may well be that the eastern apogee (B on figure one) has carried television in the past. With a slight westward regression or movement of 0.15 degrees of the apogee per day there is a 'drift' of nearly 55 degrees in a year's time. Molniya birds apparently carry only a single television transponder (centered on 3895 MHz) although audio subcarriers have been noted within the transponder.

2)Since the most useful portion of the orbit (and the portion which is activated for television relay) is the period + /- several hours each side of the apogee, it may well be that during the eastern apogee period the Molniya birds are utilized for a different function; **such as** SCPC or FDM FM communications to Russian ships operating in the Indian Ocean.

Remember that Molniya is actually a **series** of inclined orbit satellites **each following** a nearly identical track around the world; and that as one Molniya moves from west to east through the ascending node (towards apogee) and then through descending node (away from apogee) that there are additional Molniyas following the same track before and after the bird of interest at the moment. This simply means that as a bird moves into the zone of interest (+ /- a couple hours of the apogee) it is activated by ground command and it begins relay of television which it continues to relay until it reaches a point in the descending node where its movement is too rapid to be tracked comfortably by Orbita ground stations receiving the telecasts. At the point the Molniya of interest is switched off and transmission begins via the next Molniya in the chain which is at that point just entering the apogee period of interst. If you are watching a Molniya that 'suddenly ceases transmission' that is your signal to move your receiving antenna back to the point in your northern sky where you first picked up the earlier bird. All of this was covered in considerable detail in the February issue Programming Section.

OTHER CHARACTERISTICS

Video transmissions via Molniya can be received in black and white on NTSC (or PAL) format receivers with only minor adjustments to the vertial control adjustments (covered in February). Reception in color will require a SECAM adapted monitor and high quality color will require some additional refinements.

Audio on the Molniya series, unlike the audio on the Raduga/Ghorizont series of geostationary/Clark orbit birds is another matter. Raduga/Ghorizont birds utilize both subcarrier program audio (typically 7.5 MHz) **and** something called **PWM** for pulse-width-modulation (also called sound-in-syncs or sound-in-line-blanking). When subscarriers are found on the Molniya they are in addition to the primary program audio being transmitted with the PWM system.

While it is theoretically possible for Molniya and Raduga/Ghorizont series satellites to be employing virtually any form of polarization they wish, all observations to date by Birkill and others indicate that RHCP (right hand circular polarization) is the only format employed. This suggests utilizing the Birkill Hybrid Mode feed described in the Technical Section of **CSD** for February unless one is willing to 'pay' a 3 dB penalty with a simple linear probe will recover 50% of the wavefront energy present; thus the 3 dB penalty.

To recover high quality video and audio then requires that we design a baseband system that does two separate things not required for reception from North American (or Indonesian) DOMSAT birds:

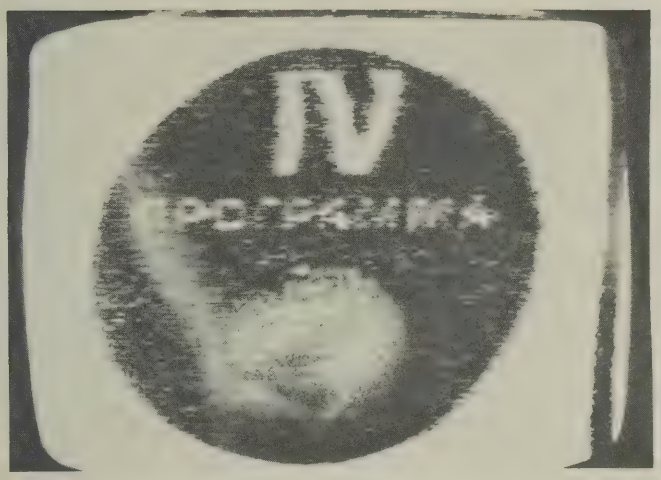
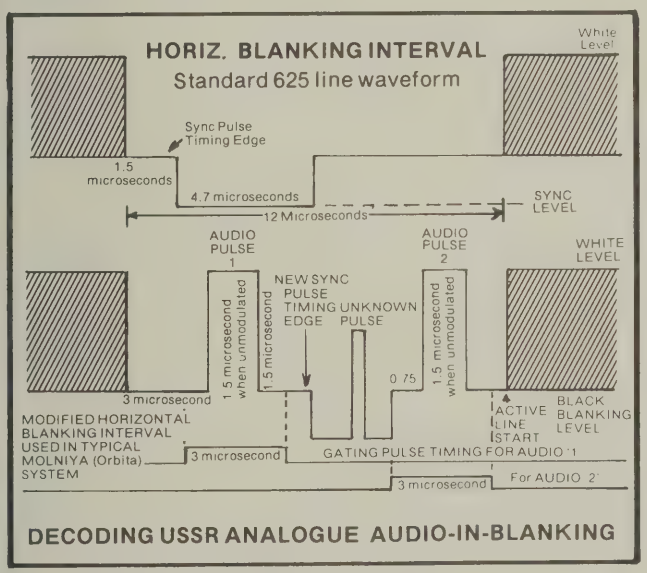


FIGURE TWO - Effect of flyback being triggered late due to the presence of the PWM audio pulse [see vertical line on right hand side of image].



1)**Recover the PWM audio**, and,
2)**Restore the video** to its original waveform or one that is compatible with our own NTSC type monitors. To restore the video we must blank out the audio pulses and re-insert correctly timed line sync pulses.

Now what happens if we only concern ourselves with recovering the PWM audio and neglect the correction of the video waveform? The PWM audio pulses present produce 'bright-up' on the horizontal retrace and then because the flyback is triggered later than it should be the picture shifts to the left slightly producing a rather bright line down the right hand side of the screen which typically shows the first audio pulse (see **figures two and three**). In figure three the image has been artificially shifted to the left beyond the amount one would normally see with an unmodified NTSC receiver to display the appearance of the twin audio PWM 'channels'. The left hand vertical line is modulated with a 1 kHz tone while the brighter right hand vertical line (second channel) is unmodulated.

BIRKILL'S APPROACH

Birkill's present approach to these twin problems is to substitute entirely new syncs and blanking, locally generated at his receiver site and timed to the incoming signal. These come from a Ferranti single-chip SPG which is a 525/625 line crystal-controlled device. Birkill feels this approach is far too

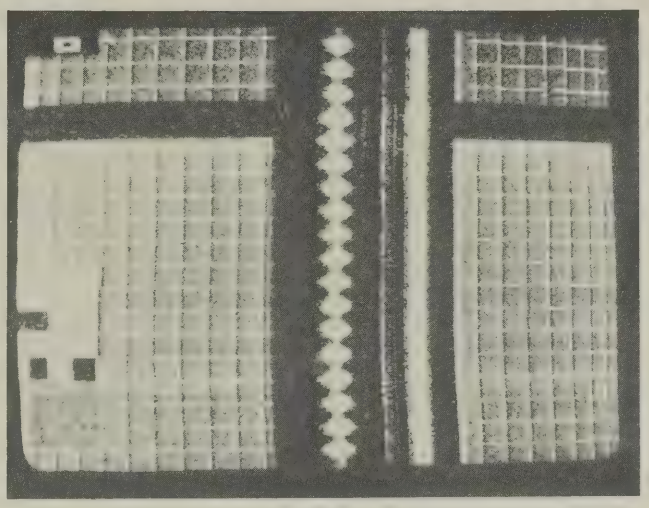
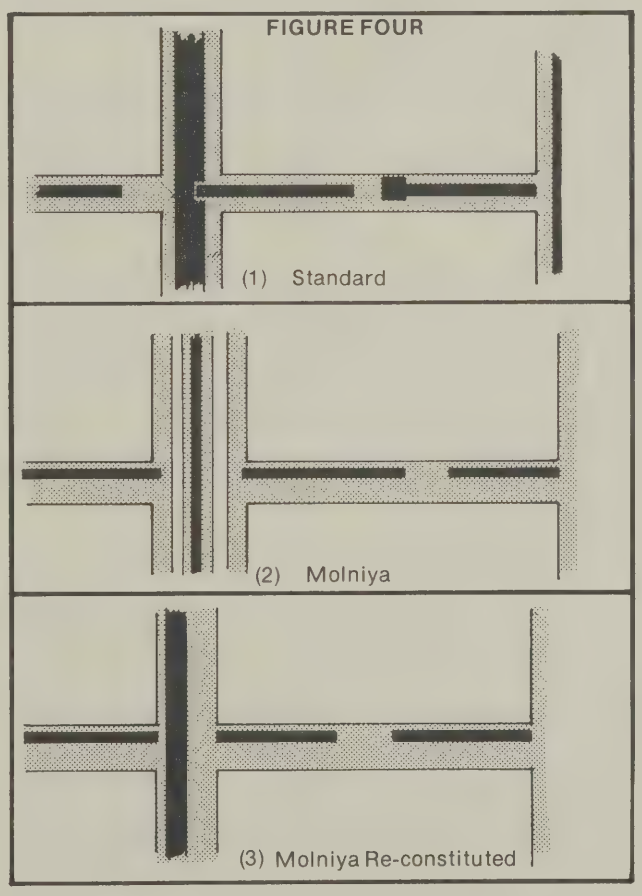


FIGURE THREE- Pulse cross display [electronic test pattern] from Molniya; audio channel 1 is modulated with a 1 kHz tone while the right hand PWM channel is unmodulated at this point.



expensive and complex for duplication today however (having been designed several years ago). He suggests a more modern approach would be to generate a new line sync and line blanking pulse using monostable device circuitry triggered by the incoming Russian line sync pulse. **See figure four.** These new pulses would then be imposed on the video in the receiver with an additional processing amplifier.

Comparatively, extracting the audio is easy. There are two (PWM) pulses involved, one each side of the abbreviated (Russian) line sync pulse. Each audio pulse has an amplitude from blanking level to peak white, and an unmodulated width of approximately 1.5 microsecond. The Russians have been observed to be utilizing both 'channels' or pulses for audio and the properly equipped terminal would be prepared to recover either separately (or both simultaneously). Thus the audio pulses must be 'gated out' from the video waveform. Birkill believes the best approach to this is to slice the pulse at mid-amplitude (for best noise immunity) and then to gate it out with a locally generated gating pulse the coincides in time with the audio pulse. The gating pulse should be wide enough to encompass the maximum width or duration of the audio pulse.

The 625 line (Russian) horizontal frequency is 15.625 kHz resulting in a line period of 64 microseconds. From the leading edge of line sync to center of pulse 2 is 3.5 microseconds and to the center of pu se 1 is 61.75 microseconds. If the pulses are capable of being modulated 100% (positively) the peak pulse width will be 3 microseconds. To avoid distortion while retaining a noise margin the gating pulse should be 3.5 microseconds wide. Thus gating pulses for audio pulses 1 and 2 should suggest generating gating pulses by triggering two monostables of 1.75 and 60 microseconds period the outputs of which trigger two more monostables each of which has a 3.5 microsecond period.

The resulting gating pulses are AND-ed (or NAND-ed) with the sliced audio pulses (the gate outputs being just the varying width pulses), recurring at 15.625 kHz but varying in width at an audio rate. At this point we go through a low-pass filter to remove the line frequency component and we have audio at a level of 1 volt or so.

This approach gives two outputs simultaneously but Birkill doubts that the Russian Molniya series ever utilizes the pair for (**stereo**) program audio so an arrangement js made to switch decoding from one 'channel' to the other. This can be done by triggering one 3.5 microsecond monostable from either the 1.75 or the 60 microsecond monostable or switching the first monostable between the 1.75 and 60 microsecond modes.

Birkill also notes that he is not certain how **accurately** the (Russian) waveform timings are maintained. If they are **not** accurately maintained the Russians may be utilizing a decoder which detects the start of the audio pulses and locks onto them. With the simple preset decoder to be described here a timing variation in excess of 0.5 microseconds could result in distortion or complete loss of recovered audio. One way around this would be to incorporate a "fine delay control" on the 1.75/60 microsecond delay which is then field adjusted by the user for best sounding audio. In this way the gating pulse can be easily 'tuned' across the line blanking period to 'find' the audio pulses.

OTHER PROBLEMS

Other than the field frequency being 50 Hz instead of our normal 60 Hz (which you correct for by adjusting either the vertical hold control or vertical oscillator to track for 17% slowdown; readjusting the monitor height control afterwards to eliminate the tall-skinny people!), there is the SECAM color problem. Birkill suggests a normal SECAM color monitor/decoder will probably use the line-rate rather than the once-per-field phase identification system. This is not a color burst (as we know it) but rather an extension backwards of picture chroma into the 'back porch' region. The gating will be from the line sync so it becomes probable that reinserting locally generated syncs will be essential for SECAM color. This can be done by shortening the blanking pulses to pass the color, or as Birkill recommends by inserting a chroma trap in the re-blanking portion of his Russian decoder box.

There is at least one more potential problem. Any true line clamps found in either commercial grade TVRO receivers or in a monitor may clamp on the back porch. If the clamp is timed from the (later) line sync it will act partly on audio pulse number 2 in the Russian PWM system producing audio bars in the video. So where the receiver has back porch clamping the system needs to re-sync and re-blank. It happens that the Howard Terminal receiver widely duplicated is not likely to have this problem since clamping is not done on the back porch in this design.

SUMMARY

CSD recognizes that on the surface "perfect full-color Russian reception" with flawless audio recovering from the PWM pulses may **not** be of interest to more than a handful of readers. **To most of us** simple recovery of the Molniya video (even with slightly degraded black and white video) will be excitement enough.

On the other hand it is important that we all recognize the inherent differences in world transmission systems since the proliferation of satellites carrying video (and audio) with differing formats is assured in the next decade. It happens that recovery of the Russian video with the PWM audio is probably about as different from recovering NTSC DOMSAT video and audio as we are likely to run into. Therefore as we progress in time and present video and audio adaption systems for various PAL and INTELSAT systems you will slowly build a knowledge of what type of terminal modifications will be required to recover all of the (color) video and all of the audio present in the sky from your location.

In our second portion of this series **CSD** will present a Birkill created system to accomplish the video restoration and audio recovery discussed in this month's installment.

3.7 - 4.2 GHZ SUPERVERTER

70 MHZ IF 30 MHZ Bandwidth 25 dB Gain 10 dB Noise Fig. 10 dB IMAGE Rejection (Min.) Mount at Antenna, SMA Input "F" Output (75 ohm), Wired & Tested, Less Power Supply

$400.00

GHZ Engineering, P. O. Box 33205
Phoenix, AZ 85067 - 602-266-9749

WASHBURN RECEIVER UPDATE

ALL PLL's NOT EQUAL?

After my presentation at SPTS '80 Miami (**The Washburn High Performance TVRO Receiver**) I noted a certain reluctance by many in the audience to accept the notion that extreme bandwidth in a PLL detector can indeed produce visible improvement in picture quality at low CNRs (8 dB region). Some with whom I chatted the day after the presentation said they had been assured by other receiver manufacturers that **all** PLL's provide the same degree of (low CNR) improvement.

Upon returning home it occured to me that a well

controlled A-B comparison under identical conditions was in order. Accordingly, the following set up was employed:

1)A Washburn Receiver carefully set up to provide a noise bandwidth of 30 MHz, operated from my antenna previously established to provide 7.4 to 9.1 dB CNRs under almost identical ambient temperature conditions.

2)The demodulator was updated to Errata 3 (**Note:** See separate report in this month's Technical Section) and carefully checked over. R19 and R20 were changed to provide a "K" (-3 dB bandwidth) of 17.1 MHz. A resistor in series with a large tantalum could then be placed in parallel with R20 to restore the normal (26.4 MHz) bandwidth without changing the phase detector balance conditions. Ultimate quieting due to the demod was measured under CCIR weighted and de-emphasized conditions and found to be 69 dB with 26.4 bandwidth and 74 dB with 17.1 MHz bandwidth; assuring that the detector noise floor would not influence the results.

Under actual reception conditions the following was noted:

3)On normal program material sparklies were still predominently white and spot-like, appearing below 8 dB CNR for the wider bandwidth loop. There was a small but definite increase for the narrower bandwidth, requiring on the order of 1/2 to 1 dB greater CNR for the same level of sparklies.

4)Tearing on abrupt transitions from white or saturated colors to lower levels was absent on the wideband loop but noticeable with the narrower bandwidth; to the extent that superimposed letters (such as telephone numbers frequently shown on the religious transponders) produced a tear equal or wider than the vertical number (letter) width itself.

5)Picture granularity (indicative of the **true** threshold where the video SNR drops abruptly) was essentially identical at the **best** adjustment of VCO tuning and DC offset for the narrow loop versus the wider loop; **however**, both picture granularity and flesh tone hue were stable over a very broad range of VCO tuning for the wideband loop versus a very definite "peak" in picture quality and continuous change in flesh tone hue with VCO tuning for the narrower loop. This effect is fully explainable in that the lower loop gain (K) causes the phase detector to operate closer to the limits of its range where dynamic non-linearities are appreciable.

6)On saturated color test patterns the wider loop was essentially at the edge of the sparklies at 9 dB CNR, with sparklies evident (but not severe) down to levels of 8 dB CNR. The narrower loop produced similar sparklie results on the same saturated color bar test pattern when optimally adjusted at CNR levels of 1/2 to 1 dB **higher**.

Clyde Washburn
Fairport, New York 14450

Clyde's new receiver can be expected to receive critical analysis from several quarters including his own competition in the receiver design and production field. Any design that proposes improved performance can be expected to hear indignant cries of "it can't be done..." **from the competition. We note with interest that the latest advertisement from Harris Communications in the CATV trade journals talks of** "...a new development in threshold extension...(**providing**) video static threshold less than 8 dB; typically 7 dB. Subjective threshold performance is even better...". **Engineers create systems; marketing types create words to describe the engineer's system. We'll all have to stay alert to remain up to date in this fast changing field!**

ERRATA #3

Owners of the Washburn High Performance TVRO Manual should take note of the following updates on this receiver system. Some update material here applies to additional corrections to the original manual while other material applies to additional information that has been created by the designer Clyde Washburn.

PLL DEMOD ASSEMBLY - A2A1A1

The following illustration errors have been noted:

1)R2 is incorrectly shown on the **top** side of the PC board (illustration on page 21) from +6V to U1-7. This resistor should be mounted **below** the PC board **from** the unused hole at U1-7 **to** ground (near ground lead of C10).

2)The components below U5 are not labeled; they are R12 (left) and CR1 (right).

3)C31 is not shown. It should be mounted across the appropriate terminals of R18 **below** the PC board.

4)Z10 is not shown. It should be mounted **below** the PC board from the terminal of R9 adjacent to C30 to the PC board hole at R18 (below Q4). Use sleeving on the leads and orient Z10 to lay over the ground area below U6.

5)Move the schematic connection of +6V to the **right** of Z9 (see page 46).

REGULATOR NOISE

Some otherwise normal 7900 series negative regulator devices have been found to produce large amounts of noise up to approximately 1 MHz unless a large value tantalum output capacitor is used. The following capacitors can be affected:

1)Demod (parts list page 23) - change C19 to 33 uF +/-20%, 10 volts (Sprague 199D336X0016DB1 or Kemet T390D336M010AS);

2)Processing (parts list page 28) - change C27 to 33 uF +/-20%, 10 volts (same as above); change C24 to 33 uF +/-20%, 10 volts (ame as above); change C18 to 33 uF +/-20%, 10 volts (same as above). Add C37 .001 uF +/-10% from U4C to U4E (schematic page 47; part is just left of U5), **below** PC board (same as A2A1A1C1).

SIGNAL STRENGTH METER

The linearity of the signal strength meter may be further enhanced by increasing the processing assembly U6B meter amplifier resistors (page 47 schematic, page 29 parts list) as follows:

1)Change R60 to 24K (same type)

2)Change R61 to 820K (same type)

With this change the output voltage to the meter can be expected to be linear +/- 1/4 dB (typical) from 1 to 19 dB and +/- 1/2 dB from 0-20 dB (typical). If the linear tracking cannot be obtained with these changes, check the meter unit itself.

MISCELLANEOUS

The center tuning meter is incorrectly indicated as 470 ohms on figure 16, page 47; it is 970 ohms nominal.

The jumper shown for the VDT 555 and 600 (page 40) is incorrect as shown. The left hand end should be dropped down to the switch lug **below** the one to which the connection is shown making it the same in this area as that shown for the VDT 400 (that view, rotated 180 degrees).

On figure 18 (page 27) U4 is erroneously labeled as Q4.

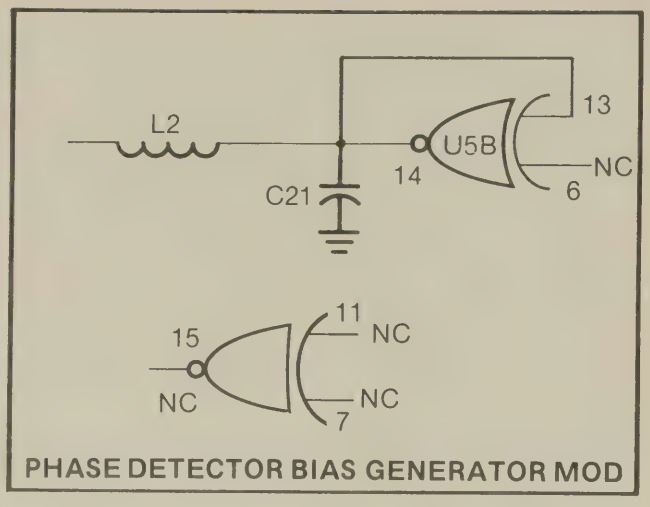
RFI PROBLEMS

The Washburn receiver brought to Miami for demonstration purposes developed a case of severe RFI (Radio Frequency Interference); apparently caused by the strong off-air channel 4 signal in the Miami area (Washburn's Rochester location has no off-air channel 4 of significant signal strength). It is recommended that the following changes be performed on all units as overall uniformity and stability are improved as well as RFI rejection:

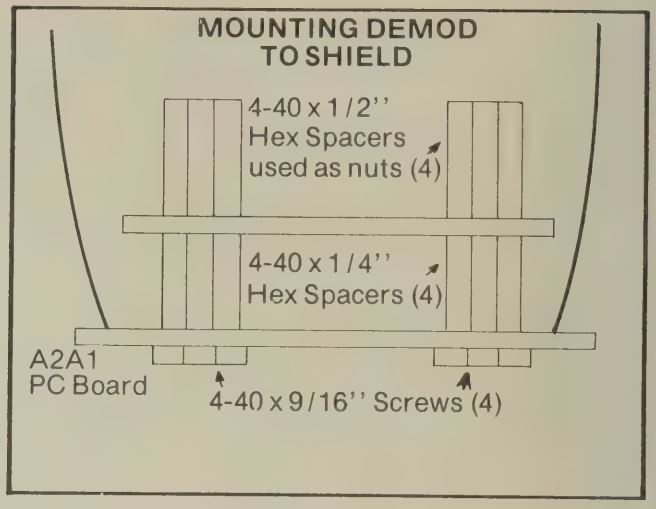
1)**At U1:** (see pages 21 and 46) Delete C9. Add R24 (30 ohm, +/-5%, 1/4 watt, carbon comp) in series with C6 as follows:

a)Mount R24 upright and tight to board in the hole of U1-14. Install one lead of C6 in the ground hold below R24. Place the body of C6 below and parallel to C7 wrapping the second lead of C6 around the top lead of R24 (solder). Note that the 'above' and 'below' refers to the assembly drawing view appearing on page 21.

2)**At U5:** (see pages 21 and 46) Delete CR1, C24, C25, R15, R16 and R17. Cut the trace from U5-14 to U5-11 near the lead of R14. Relocate C21 as follows:



PHASE DETECTOR BIAS GENERATOR MOD



a) Reference assembly drawing, page 21 - use the lower hole shown for C21 and the upper hole shown for the (unlabeled) standing resistor (pins U5-12 and 13). Bend the lower lead over **below** the board so that it also connects to U5-14. The phase detector bias generator now consists only of U5B tied around itself with no connection to U5C. See schematic here.
b) Change R20 to 150 ohm (same type)
c) Change R19 to 1K (same type).

Additionally, the operation of the PLL demod assembly (A2A1A1; schematic page 46) will be easier to track with the setting of R3 if R4 is changed to 1.2K (same type; film).

Finally, the most convenient method worked out to date to mount the demod to its shield is shown here. Additionally, J1 is best mounted by first putting an extra 3/8 control nut on the jack, then installing it into the shield with just enough protrusion for the lockwasher and nut; then tightening the outside nut. The center pin will now be directly over the hole at C1 (see schematic page 46) minimizing the lead length.

SMALL TERMINAL ANTENNA NOTES

SWAN ANTENNA KIT?

CSD has recieved an abnormally high enough of letters concerning the Swan Spherical TVRO Antenna system described in our STT manual; it seems some users of that manual are having difficulty figuring out exactly how to build the antenna.

The antenna is perhaps so simple to understand and to duplicate that readers are attempting to make more of it than they should. We have been hoping the somebody would come along, in the absence of Oliver, and offer a 'kit' for private home use of the antenna. It appears somebody is about to do so and we hope he has a big mail box!

Hayden D.McCullough(**Vidiark Electronics Development Co., P. O. Box 57, Salem, Arkansas 72574**) first met Oliver Swan during the Oklahoma SPTS event this past summer. From Oliver's description of the antenna and with Oliver's encouragement he set out to build his own. The photos here attest to the construction of the antenna. McCullough notes:

"The geometry is 100 percent Oliver Swan. The mechanical design however is original with me. The frame is 1-1/2" x 1-1/2" x 1/8" angle iron. All pieces are straight. The lattice strips are 1/2" plywood that is 3" wide on the vertical

McCULLOUGH'S '8-BALL' ANTENNA - has the geometry of the Swan Spherical but the construction mechanics is pure original. A 16 footer is under construction.

THE '8-BALL' ANTENNA coated with ice after an Arkansas winter freezing rain. Note build-up of slick stuff on the feedhorn and a generous helping of dangling icicles! Antenna kit to be available in 12 foot size is projected to price in the $400 region.

and 1-1/2'' wide on the horizontal. Spacing of the horizontal strips is 8 inches center to center which for this amount of curvature allows the surface to deviate less than 1/20th of an inch between the strips. The antenna pictured is a 12 by 12 foot size and it provides sparklie free pictures using an SCI/150°LNA and an AVCOM receiver. The f to D is 1.25; I suspect there may be another dB or perhaps 2 in there someplace with a more efficient feed horn; mine is 16 inches long with an 8 inch by 8 inch mouth.

This is a very stable, solid antenna and can be adjusted to surface tolerances well within the 1/16'' suggested by Oliver. I have called it the '8 Ball' (get it?) and I am starting on a 16 foot version. The LNA feedhorn is mounted on a piece of 6'' plastic sewer pipe with springy spacers in between. As we are living in 'the early days' of satellite television I go outside to 'turn' my antenna. The rotor comes next.''

McCullough reports that he plans to have the antenna available as an assemble-it-yourself kit around the first of May; perhaps before. The price will be in the $400 vicinity and this will include all of the material cut to fit together, all holes drilled and ready to assemble. The horn/LNA/rotor will also be available on a platform (less the LNA) as an option.

Most people who seem to be having difficulty with the Swan plans are short on elementary geometry. Many skipped over the material appearing on page one of the manual which expresses Oliver's wish that anyone purchasing his manual be encouraged to duplicate his work; but also noting that because Oliver believed he might have certain (valuable) proprietary rights with his antenna that he was purposefully not giving highly detailed plans in the manual. We've heard from many who have followed the manual guidelines through to successful acquisition of the TVRO signals and therefore believe that if you are having trouble with your understanding of the antenna system, that your next stop should be a high school geometry book.

When McCullough has his antenna kit on the market we'll advise you here. In the interim if you can't wait you can write him at the address given.

CHARACTERIZING THE HOWARD HORN FEED

Several builders of the Howard Terminal Manual have expressed an interest in the measured operational parameters for the feedhorn included in the Howard Manual. Jack Trollman of Equatorial Communications recently completed a series of tests on this feedhorn (see photo illustrations) at the request of Tay Howard. These tests indicate (much to Tay Howard's relief) that the Howard Terminal feedhorn is indeed a very suitable antenna for the uses described in the manual.

The horn was designed to be a compromise between high

gain and low noise performance over a two to one range of f/D ratios. The generally accepted maximum gain compromise is to have the illumination energy down 10 dB at the edge of the dish, while the minimum side lobes are to be down 20 dB (lowest noise is related to the side lobe performance). The range of f/Ds found in most of the antennas either now on the market or described in the literature is from 0.25 to 0.55. Radio Astronomy and other antennas designed for low noise and minimum sidelobe performance are generally fairly deep; that is, with f/Ds in the 0.25 to 0.30 range. On the other hand the parabolic surfaces designed for maximum gain (with less atttention to lowest noise and improved side lobe performance) are usually fairly 'flat'; with f/Ds in the 0.5 region. The most common compromise between these conflicting requirements is to build antennas with an f/D of from 0.4 to 0.45.

The feed compromise which should be made with a prime focus horn for TVRO use should be toward the low side lobe / low noise illumination end of the scale. That says being 15 dB or so down at the edges of the parabolic surface.

The Howard Terminal Manual feedhorn measurements, courtesy of Jack Trollman, are shown here in **Table One**. The actual E and H plane patterns measured by Trollman were plotted and added to this set of numbers was the space attenuation to the edge of the dish for each f/D. Table One is a set of averages for the E/H planes plus the space attenuation losses.

The conclusion to be drawn from Table One is that the Howard Manual feedhorn is a reasonable compromise for f/Ds between 0.3 and 0.5 for TVRO use. The gain and noise differences balance in such a way that carrier to noise ratio (C/N) performance will vary only a fraction of a dB over that range of focal ratios. Stated another way, the effort spent on designing and building a customized horn for a particular reflector f/D will probably buy very little in performance; generally under 1 dB additional gain in the very best case.

Finally, as Tay Howard notes "While there is no magic left in the reflector antenna game, we shall probably hear magical sounding claims in the next year or two as people or firms new to the business and measurement of gain (C/N) learn what it is all about. There is still some good engineering to be done...particularly in the area of new materials and manufacturing techniques which will ultimately produce dual reflector antennas having C/N performance perhaps from 1 to as much as 2 dB better than what we have now come to accept as standard. I feel these will not be prime focus, 55% efficiency antennas, but rather dual reflector on axis and offset fed configurations with aperture efficiencies approaching 80%."

HOWARD TERMINAL HORN design as in use at the Howard Terminal in California.

TABLE ONE

f/D	Edge Illumination
0.5	**-11.4 dB**
0.45	-12.4 dB
0.40	**-14.4 dB**
0.35	-16.4 dB
0.30	**-18.6 dB**
0.25	-23.0 dB

THE WORLD ABOVE 10 GHz

by
Robert M. Richardson
Richcraft Engineering Ltd.
Drawer 1065
Chautauqua, N.Y. 14722
[716]753-2654

SUMMARY

Last month's episode described how very easy it is to build a crystal-controlled weak signal source for either the 4 GHz TV satellite band or 10 GHz amateur band using a VHF Engineering TX-432 1 watt kit transmitter as the crystal-controlled rf power source. This month we will describe a relatively simple procedure you may use to determine the azimuth of your big TV satellite parabolic reflector antenna to within approximately 2/10th of one degree accuracy if you can tilt it over so as to receive a signal from last month's crystal-controlled weak signal source.IF you cannot tilt your antenna over to the horizontal plane, skip our column this month.

ANTENNA ALIGNMENT FUNDAMENTALS

Over 100 of you Satellite Digest readers have availed yourselves of our FREE (for $5) service that gives you a computer printout of the azimuth and range from your home location to all the Comstars, Westars, Satcoms, Aniks, and Statsionar birds in the western hemisphere. Counting computer time, secretary time, postage and handling it costs us about $7.50 per printout, so this month onwards the price is hiked to the munificent sum of $7.50 each. End of commercial.

Now that you know where you wish to point the big bazoo you have the problem of **how to point it**. That is what this month's column is all about. A better title for this month's column would be: **"ELEMENTARY SURVEYING 101 - USING THE NORTH STAR."** We will not insult your intelligence by going into the Cub Scout routine of telling you how to find the North star, Polaris, on a clear night. If you cannot find the big dipper, you have a problem. Go directly to the nearest Cub Scout, do not pass GO, do not collect $200. Ask the Cub Scout to show you how. By one means or another, we shall presume you know how to locate the North Star.

THE METHOD WE PLAN TO USE

1)We are going to build a "sort of" homebrew transit from a camera tripod, a $5.00 B-B gun telescopic sight, and a 49 cent piece of dime store steel measuring tape.

2)We are going to "shoot" Polaris on a clear night and place a stake in the ground which is "true North" from measuring site.

3)On a clear sunny day we are going to rotate our telescopic sight on its level tripod mounted platform till the marks from the steel rule which reads out 1 degree for every 1/8th inch mark tells us we are on the azimuth to the bird we wish to locate. We will put the stake in the ground for each bird's azimuth...and hopefully mark it.

4)We will spot our crystal-controlled weak signal source over the stake representing the azimuth to a given bird (hopefully at least 100 feet away from our dish), and rotate our big dish for maximum received signal on 4 GHz. The dish should now be pointed exactly at the correct azimuth for this particular bird. All we need to do now is to tilt the dish to the bird's correct elevation angle, and if we did everything right, there it is. Like most good things in life, it is actually much easier to do than describe.

BUILDING THE HOMEBREW TRANSIT

If you already have a fairly sturdy camera tripod, you're already half-way done. Otherwise, we suggest the Sears-Roebuck #3HA8465 tripod which is in the $40 price class.

A)Purchase a cheap steel tape measure **insert replacement**.
B)Using a jig saw or sabre saw, carefully cut out a disk of exactly 14-11/32'' diameter from 3/8'' exterior plywood.
C)Drill the exact center of this plywood disk 1/4'' D.
D)Insert a 1½'' long by ¼'' diameter bolt **with** 1/4'' body or fender washers on each side through center hole and tighten snugly.
E)Mount bolt with disk on it in a drill press or heavy duty electric drill.
F)With a piece of sandpaper on a sanding block lightly sand down the circumference of the plywood till it equals exactly 45 inches, no more, no less. Measure circumference frequently so you do not over do it.
G)Glue a sheet of heavy white bond paper to one side of the plywood disc with rubber cement, trimming edges cleanly with sharp scissors or razor blade.
H)Cut off tape measure at exactly 45 inches. Now, using scotch tape temporarily mount the tape on the circumference of the plywood disk with **measuring** side of the tape on the **inside**. Allow about 1/8'' of the tape **over** the edge of the disk so you can readily see the 1/8'' markings.
I) Using a sharp pencil, mark every 1/8'' around total outer edge; i.e., 8x45 = 360, hence every 1/8'' mark = 1 degree.
J) Draw a pencil line with a ruler from the center out to every 10 degree mark and number appropriately.
K)Using a 15/32'' D drill bit, re-drill center of plywood disk. Press fit and epoxy and 1/4-20 nut into center.
L) All U. S. standard camera tripods have 1/4-20 bolts mounted in the center. Using a center punch first, carefully drill a 1/16'' deep hole in the center of this bolt with a #60 drill.
M)Using either plywood or balsa wood, make a ''U'' shaped cradle approximately 10'' long to snugly hold the cheapy B-B gun or .22 telescopic sight. Epoxy the pointed end of a small finishing nail in the **exact** center of this mount so the point protrudes about 5/16'' from the bottom as it will center itself in the hole drilled in ''L'' above.
N)Using stiff piano wire about 1'' to 2'' long, epoxy these pointers in the center of the front and rear segments of the ''U'' shaped cradle. Adjust length so that pointers exactly reach the outer disk degree marks. With cradle centered and one pointer on zero degrees, the other should be **exactly** on 180 degrees if aligned properly.
O)Make a plum bob from a heavy nail and hang with string from the bottom center of the tripod.

STAKING TRUE NORTH WITH W4UCH TRANSIT

Is simplesville personified **if** you can see the North Star from your big dish's site. If do not have a clear shot at the North Star, buy a Nautical Almanac/Ephemeris, study 15th century navigation, and use another star, planet, or the moon. Let us presume you do indeed have a clear shot at the North Star and proceed from there rather than getting all wrapped up in the fundamentals of reverse navigation; i.e. ''you KNOW where you are, all you are trying find is an **exact** true heading reference, hopefully to within .2 degrees accuracy.'' The other alternative is to use a compass, correct for local magnetic variation, ''east is least and west is best,'' and issue a silent prayer as this method **may** or may not give you the accuracy you need **unless** you have an **accurate** bench mark.

This method starts off much like gypsy chicken-pot pie, the recipe states: ''first you steal a chicken,'' but instead of a chicken, ''first you borrow or steal a carpenter's level,'' if you do not have one. Set your tripod up over the center of your big dish's mounting point. Tightly screw the tripod's 1/4-20 mounting bolt into the plywood disk's mounting nut. Using the carpenter's level, level up the plywood disk in both axis with the zero degree mark pointing due North. How do we know it is pointing due North? Courtesy of the North Star of course and our cheapy telescopic sight sitting on the plywood disk. If the disk is leveled correctly, you should be able to change the elevation up and down with the level lying crossways on the disk showing **level** for any angle of elevation.

Our scope sight merely sits on top of the plywood disk and is held in place solely by the small nail that rests in the drilled out center of the tripod mounting bolt. It may be lifted off the plywood disk and the level placed on the disk cross-ways to

FOR YOUR EARTH STATION, CHOOSE
AVCOM'S PSR-3
SATELLITE VIDEO RECEIVER
DESIGNED FOR YOUR PRIVATE TERMINAL
•Remote tuning
•Dual video outputs
•Exclusive Clamp-Sync & Scan-Tune
•Many other features!
AVCOM of Virginia, Inc.
10139 Apache Road, Richmond, VA 23235
(804)320-4439

SATELLITE TV
RECEPTION MADE EASIER!
For those who are working with the Coleman or Howard TVRO system Manuals, here is a selection of PC boards, kits or assembled units which will get you 'up' and 'on-the-air' much sooner!
The following boards piggy-back to the popular Coleman LNA carrier boards to provide you with regulated power for the important low noise amplifier
Model | Board Only | Kit | Wired/Tested
CSAB | $2.00 | $7.00 | $15.00
CDA | $5.00 | $6.00 | $10.00
To receive a pair of systems designed MHz tuning for subcarrier tested, specify subcarrier mount for easy 'stacking'
Model | Wired/Tested
SAA-1 LM3065 | $18.00
SAA-2 LM2808 with 2 watts audio
If you are fighting the IF system **with** a built-in channel 3 RF remodulator, here's your answer! To add audio, order one or more SAA boards.
Model | PC Board Only | Kit | Wired/Tested
70HIF | $10.00 | $60.00 | $118.00
All boards are supplied with complete data and all boards are designed around the popular circuits found in the coleman and Howard TVRO manuals.
For more information contact ROHNER MACHINE WORKS, INC
John P. Rohner Seventh & Elm Streets
West Liberty, Iowa 52776 (319-627-2510)
THIS PRODUCT NO LONGER AVAILABLE

check alignment as often as you wish. Once you are satisfied you have the disk exactly on true North, leave the tripod in place and go to bed till the sun comes up.

Now comes the fun part of the program. The sun is out and shining brightly. With your plywood table aligned exactly on true North we merely rotate the scope on the **level** table to whatever azimuth our first TV satellite is located at and drive a stake in the ground around 100 feet away. Continue placing stakes for the other satellites whose azimuth you wish to mark. That's all there is to it.

FINAL AZIMUTH ALIGNMENT FOR THE BIG DISH

You have surely read in the literature all the advantages and wonderful things that **Polar** dish mounts afford the user. Sad to say, most polar mounts will **not** work with this method of alignment. Here is where the AZ-EL dish mount really shines as it works perfectly with this simple system of alignment. As the venerable madam said, "you pays your money and takes your choice."

Place the crystal-controlled weak signal source over the stake you drove into the ground for a given bird around 100 feet or more away from your big TV satellite dish. With the big dish aimed at the weak signal source "swish it about a bit in azimuth" until your satellite receiver's "S" meter indicates you have it on dead center and mark your AZ-EL mount accordingly. **Beware** of multipath reflected signals. If your satellite receiver's "S" meter shows maximum when the big dish is aimed 10 ot 15 degrees **away** from the weak signal source, what you are picking up is a multipath reflected signal. It is just like VHF/UHF instrument landing systems multipath effect. Do not fly your aircraft into a mountain ridge or land it on a rice paddy just because the localizer and glide path needles are centered on the multipath signal. Similarly, make doggone sure you have the **direct** signal from the weak signal source before you mark your polar mount for this bird.

FINAL ELEVATION ALIGNMENT FOR YOUR BIG DISH

A 9 to 12 inch diameter plastic protractor, either draftsmans' or homebrew type located at the elevation axis of the big dish mount will give you a good starting point for elevation alignment. Just as before, "swish it around a bit," for maximum signal. That's all there is to it.

GENUINE HOWARD TERMINAL PC CARDS

Bob Coleman and Tay Howard are now producing four PC cards which make duplication of the Howard Terminal (latest version) system a snap!

(A) Dual Conversion (4 GHz to 70 MHz) - $25.00
(B) 70 MHz IF and Filter - $25.00
(C) Howard Demodulator - $40.00
(D) Dual Audio + AFC - $25.00

These proven and tested high quality boards are available as a four-board-package for $99 including complete documentation and a list of distributors stocking parts. Parts kits also available from DACOM.

Order from: Robert M. Coleman, Rte. 3, Box 58-A
Travelers Rest, S.C. 29690

RICHCRAFT ENGINEERING LTD.

...offers you a computer generated printout for antenna azimuth and elevation pointing from your receiving site to all major geostationary satellites capable of being received in North America. This provides you with a basis for locating the following satellites: SATCOM F1, F2, and, WESTAR I, II and III, and, COMSTAR I, II and III, and, ANIK III and B, and, Ghorizont, and, STATSIONAR 4. Provide them with your geographic coordinates (longitude and latitude to within 10 minutes, taken from Road Atlas if no other source is available) plus $7.50 to handle shipping and handling and write to Richcraft Engineering Ltd., Drawer 1065, Chautauqua, New York 14722 (716-753-2654).

SATELLITE TV EXPERIMENTERS
INTRODUCING A COMPLETE
3.7 — 4.2 GHz DOWNCONVERTER
•3.7-4.2 GHz in, 70 MHz out
•Remot[illegible]e control tuning
•Dual [illegible]n - stable
•Asse[illegible]ted Only $895.

Pola[illegible]mote Feed Rotation
[illegible] Dish.
[illegible]stpaid

[illegible]PLIES
•Teflon [illegible] 2.55
1/16"x9
1/32"x9"x
•Chip capacitor
39, 220, 4700 pf..
•SMA and microwave [illegible], inquire
•2"x14" copper tube for Birkhill feed, 3 lbs. $12.00
WRITE - We are adding to our inventory!
SATELLITE INNOVATIONS
P. O. Box 5673
Winston Salem, N.C. 27103
Add $2.00 shipping and handling (except for plans)

THIS PRODUCT NO LONGER AVAILABLE

TECHNICAL CORRESPONDENCE AND NOTES

IMAGE NOISE?

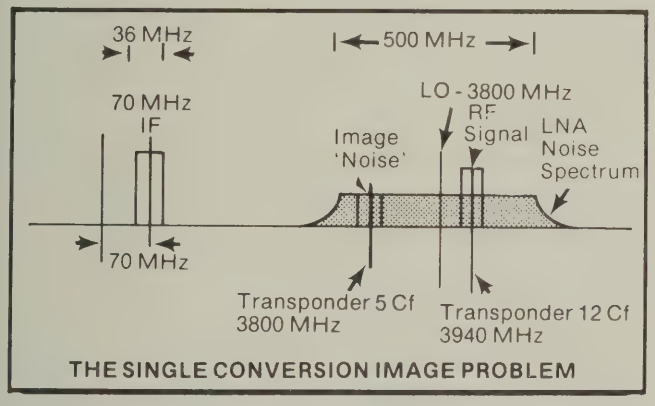
I don't understand how the Coleman (or any other) single conversion down converter, with or without an active mixer, can yield an optimum noise figure. After all, the image frequency is only 140 MHz below (or above) the desired RF signal and certainly within the bandwidth of the LNA. Even if it is argued that there is no RF transmission at the image frequency because it falls in between transponders the LNA will still put out noise at the image frequency. Thus, the noise at the output of the LNA, at both the RF signal frequency and the image frequency, will appear at the 70 MHz IF. With Howard's double conversion system the image frequency is over 2 GHz from the RF signal frequency so it is probably beyond the bandwidth of the LNA and the mixer. Thus the

single conversion system would appear to see twice as much noise from the LNA than the double conversion system. The single conversion technique results in doubling the noise temperature of the system.

If my reasoning is incorect I would appreciate an explanation of where I went wrong. If I am right I will then attempt to build an image rejection mixer for my single conversion down converter.

Norman R. Scheinberg
Jet Propulsion Laboratory
Pasadena, CA 91103

Your reasoning is sound enough. There is a performance/system cost trade off going on here when a builder opts to single convert rather than double convert in arriving at the final (usually 70 MHz) **IF. The 70 MHz IF places your image as shown here; if the LO is on the low side of the incoming RF signal** (it is also possible to have the LO above the incoming frequency in which case the image frequency is above). **Image frequency bandwidth can contain pure noise, another modulated transponder channel or some combination of the two. As an example, if your desired transponder is number 12** (3940 MHz) **your LO on the low side would be 3940 -70 or 3870 MHz. The image would be 3870 -70 again or 3800. It turns out that 3800 is the center frequency for transponder 5;** a vertical transponder. **Transponder 12 [our desired channel in our example] is a** horizontal **channel. Thus the image falls** (always) **on a transponder of the** opposite **polarity [or outside of the band entirely]. This suggests since we expect to have between 22 and 27 dB of cross-polarization rejection as a minimum on SATCOM and COMSTAR birds that we won't see the actual RF signal from the image frequency** (as long as our cross pole rejection of our antenna is good).



THE SINGLE CONVERSION IMAGE PROBLEM

But there is noise there and that noise does hit the mixer. Whether it degrades the system noise temperature by 3 dB (double the noise voltage) **is arguable. Whether it degrades it to** some **measurable amount is** not **arguable. Single conversion receivers cost less to build but at some [measurable] penalty in performance. A handful of the commercial receivers on the professional market single convert to 70 MHz but they do so with the addition of an [expensive] 3.7 to 4.2 GHz** 'tracking filter'. **This filter tracks through the 4 GHz downlink frequency span as the radio is [voltage] tuned and place a typically ±/-25 MHz wide bandpass filter between the LNA output [receiver input] and the downconversion mixer. By doing this they reject the 140 MHz removed image component. Tracking filters have remained expensive at 4 GHz [and on occasion erratic in operation] but in some design minds it is less expensive to install a tracking filter at the input than it is to design a double conversion system.**

If one presupposes that tracking filters could be built cheaply in mass production, and their erratic behavior [at 4 GHz] tamed, then this opens up a designing challenge for some inventive soul. We suggest that a well designed tracking filter, capable of being mass produced at low cost, would earn for its inventor big bucks because with such a device readily available virtually all of the sound arguments for double conversion disappear. Double conversion remains the pure way to go today **but only because of this problem.** Anyone feel the challenge?

VTR DEGRADATION

In reading your part 4 of the excellent series appearing in Radio Electronics, I wanted to comment on a rather obscure technical point. You advise possible use of the home VTR for modulation (via the built-in modulator in the VTR) of the video signal received from the satellite receiver. Some early VTRs did in fact allow loop-through video. However, to the best of my knowledge, all current VTRs (whether U-Matic, Beta or VHS) do not have loop through video but rather E-E video. This means that the video signal has the luminance and the chroma split, the chroma downconverted to 688 kHz, and otherwise processed as if for recording...and then converted back up to NTSC as a video signal. This is useful to assure that your (record) electronics is functioning properly. Unfortunately this also results in a significant loss of video quality...compared with the quality that one would expect of a video signal that does not undergo this unnecessary (for TVRO modulating) E-E processing. Of course such degradation of the video signal works to cross purposes with the excellent quality one would expect from a satellite TV signal.

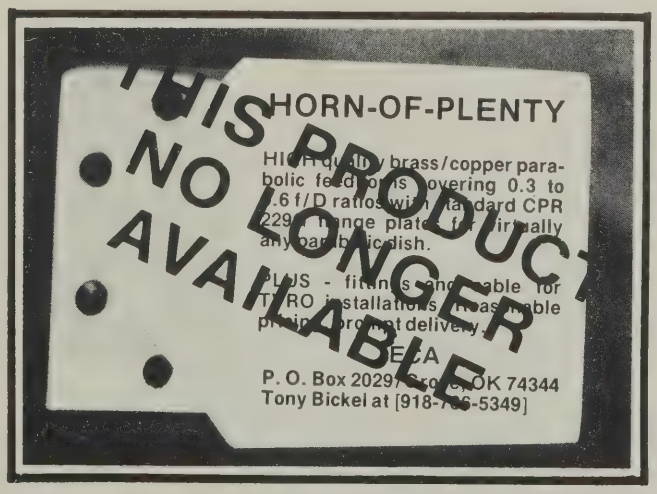
Carlton Sarver
New York, NY 10024

We've heard that suggestion previously and agree that if you run identical satellite video feeds into side by side 'modulator' where one consists of a VTR and the other consists of a designed-for-CATV modulator you can see with the eye detectable degradation of the VTR (re) **modulated signal. Is there a reader out there who is well versed on this subtlty of VTR design who could provide both a straight forward explanation of what happens to the video signal as it 'loops into' and through a typical VTR, as well as a discussion on how bad a choice you might be making by utilizing a handy-dandy VTR as a modulator for home TVRO reception? We'd all like to know more about this, and a solution if there is one!**

STARTING YOUNG

I am a junior in high school and currently attempting to build one of the most inexpensive earth stations ever built as a project for the Westinghouse Science Search; a top notch scholarship project. Through trial and error I have been able to come up with a block diagram which I believe will work.

My project began when I saw Bob Cooper on the **CBS Evening News** in October of 1978 describing his own private satellite terminal. And I am now plugging into the right sources and coming up with some information. I am very interested in microwave technology and **will** make a career out of it. I read Coop's series on microwave Gunnplexers in **Popular Electronics** (October and November 1978, January 1979). My hat is off to Coop for creating these projects and publishing them!



I fully expect that because of appearing on newscasts and the like you have been swamped with requests for help. However I would really appreciate your looking at my block diagram and suggesting how it might be improved.

Brian Crawford
P. O. Box 1034
Wasilla, Alaska 99687

Brian's diagram, which he thought out for himself, shows a 120 degree K LNA driving a mixer which is also driven by an LO operating in the 3630 to 4130 range. He demodulates at 70 MHz and feeds into a low power TV modulator and into his TV set. That is of course Robert Coleman's approach almost to the crossing of the T. We remember our **junior year in high school** (barely) **and how we entered a national science fair project with a demonstration of long range television reception. With such fond remembrances of our own youth** (yes, we won the science fair contest for the state of New York) **we shipped Brian a set of manuals from STT as a gift. We expect he is now up to his eyes in scrouging microwave parts.** Help a youngster stay off the streets of Wasilla. **Like any 15 year old he's scrounging for microwave parts.** Send him some!

WANTS IT CHEAP

We have become quite interested in satellite TV reception and the recent series of articies in RADIO ELECTRONICS has been most helpful. Since the FCC recently removed the licensing requirement, we feel that the interest and market is bound to escalate very rapidly.

Unfortunately being a lowly state electronics technician my budget cannot tolerate the likes of Collins, Hughes, Microdyne and other commercial video receivers and LNAs. Being a typical Ham I have been searching for surplus and economical equipment sources which can be converted to satellite reception. I have access to a dish about six foot in diameter which has been in service in the 960 MHz STL band. Can it be made to work?

Deane Harper
Conway, Ar. 72032

Several people have six foot systems up and running in the midwest and the pictures, while not perfect, are quite good. As most are aware, we did extensive tests on a six foot terrestrial microwave antenna (see front cover of Satellite TV Handboodk for photo) **and found that with a 120 degree LNA you could enjoy the pictures in a 35 or 36 dBw footprint region although they wouldn't earn you any awards. One chap told us he has taken a six foot and 'expanded it' to an eight foot and that got him around 1.5 dB more signal. The bottom line is that a six foot will produce watchable pictures, with sparklies and some audio noise, with either surplus converted gear** (as per our Coleman TD-2 Conversion Manual) **or with start-from-scratch gear such as the Howard Terminal receiver. Once you get it up and running, then you can worry about making the antenna bigger. Was the first car you bought the last car you bought? Sometimes it is more important to be moving down the street than to spend too long waiting for the exact model, color and equipment you'd ideally like to have!**

LNA BOARDS AND HELP

Simcomm Labs (Box 60, Kersey, Co. 80644/(303)352-1020) is a relatively new source of microwave hardware circuit boards and sytems that will help you get your own homebrew TVRO up and running. Simcomm has the following circuit boards available:

1) **LO-1A** - a 2300 MHz local oscillator board with a crystal controlled source and 18 X multiplication; Output level is 0 dBm ($32.50);
2) **RF-1A** - an RF amplifier capable of delivering 2 watts output at 2,300 MHz utilizing four NEC transistors (not supplied), $22.50;
3) **SL-2B** - 2,300 MHz receiving converter with 2 stages of RF gain, remotely tuned LO with AFC provisions, three stages of IF gain (any IF from 30 to 300 MHz), conversion gain typically 45 dB, $22.50;
4) **IF-1A** - a 70 MHz IF amplifier with 115 dB of gain on four PC boards and a pre-amplifier board; typical bandwidth 25 MHz, with built-in baseband output and FM discriminator, AFC output (with amplifier), ($125.00).

Of particular interest to the TVRO enthusiast is an LNA board utilizing three stages of NEC GaAs-FET providing 38 dB of gain with a 1.2 dB noise figure. The **LNA-2B** board sells for $55 and comes with documentation for construction of the LNA (**note:** NEC devices presently recommended are the NE244 [2 stages] and NE 218 [one stage]).

TECHNICAL NEWS NOTES

RCA now plans to launch the SATCOM FIII replacement and have it operational by October of 1981 while the SATCOM FIV bird will be operational by February 1982. RCA is hoping to upgrade the FIII replacement and FIV birds from the nominal 5 watts per transponder to 5.5 watts output (0.3 dB increase on ground) on 18 of 24 transponders while the other six will boost to 8.5 watts output (2.1 dB increase on ground). How the various users will be juggled for the 8.5 watt output transponders is anyone's guess at this point.

COMSTAR IV may have to be 'forced' into orbit before end of 1980; probable use of COMSTAR D-2 bird (see separate report this issue, programming section) for up to 11 channels of cable programming plus failing health of other COMSTAR birds (noteably D-1 at 128 degrees west) is forcing issue.

INSAT system, domestic C band satellite for India, is nearing design completion. It looks like it will be a 12 transponder bird with a minimum ground EIRP of 32 dBw plus two S band transponders at 42 dBw level.

1983-4 launch dates are forecast for pair of French-German direct to home satellites. Birds will locate at 19 degrees west, with coverage areas of 2.5 degrees longitude 0.98 degrees latitude for the French operation, 1.62 degrees longitude and 0.72 degrees latitude for the German portion. A total of 5 TV channels will be on both birds with the French utilizing right hand circular and the Germans left hand circular. Output powers in the 11/12 GHz bands will be on the order of 200-260 watts per channel.

NASA is proposing to launch a pair of 20 GHz downlink (30 GHz uplink) satellites to test spot beam concept over US. One bird would divide US into 25 areas with a spot beam dedicated to each; the second would provide ten high density spot beams to major metropolitan areas (only). ATT's latest proposal calls for spot beams that 'scan' across nation in fraction of a second.

Serious blow to Japanese domestic satellite/rocket program occurred as experimental ECS-B Ka band (32/35 GHz) satellite disappeared during (you guessed it...) apogee kick motor firing. Satellite was launched February 22 from Japanese Tanegashima test range, and 8 seconds after apogee motor firing it discontinued radio telemetry signals. SATCOM FIII had similar problem 15 seconds after apogee motor firing last December. In all five different satellites (including original SYNCOM I) have been lost during this apparently critical manuever.

Soviet Raduga series bird Statsionar-2 was launched in February and should be operational at 35 degrees east by time you read this. Soviets reported launched total of 12 satellite payloads during February.

COOP'S COMMENT ON PROGRAMMING

AFTERMATH OF SPTS MIAMI

Last month's **CSD** reported on the apparent good fortune of those suppliers who were able to sign up early enough to get exhibit booth space at SPTS '80/Miami. We reported in excess of $2.5 million in orders to come from show contracts. An industry trade newsletter (**Satellite News** in their February 20 edition) noted ''Major earth terminal equipment makers were '**probably flabbergasted** ' at the amount of business...at SPTS Miami''. The majors in this case means the Scientific Atlantas, the Microdynes, the Microwave Associates and so on. If they were flabbergasted (all had at least one representative present and roaming the floors) their sentiment was equally shared by the 'minor earth terminal suppliers' in attendance.

The fact is SPTS Miami was possibly too successful. Too many people bought too much equipment and too few suppliers are available to fill the overflowing order baskets. A few stories (true) will suffice to illustrate the dilemma these pioneering manufacturers face.

One antenna supplier walked into the show having sold a dozen antennas prior to the event. He walked out with orders for more than 200 and that number again promised.

One receiver manufacturer with a prior to SPTS production run of 25 units left the show with orders for more than 250 units; and an additional 600 or so promised.

People representing themselves or firms that wanted to be in the re-sale (i.e. installed terminal) business were perplexed by the long lead times. A Nebraska correspondent writes ''I have kept in contact with some of the (hopeful) distributors who attended in Miami and we have all come to the same conclusion...that is, there are very few companies that can deliver product in a reasonable period of time. Many were 'promised' off-the-shelf delivery at the show. That turned out to be 30-60 days by the end of the seminar and now we are finding that it will be 90-120 days for actual orders''.

Another would-be distributor writes ''I have designed a marketing plan that is modest to begin with; in a two state area I feel confident I can sell 100 installed terminals per year. However, getting the first one delivered to me seems to be a big problem!''

Yet another distributor-to-be voices concern that the flame of this new industry may blow out early-on simply because the demand is so greatly exceeding the available supply. ''With the next seminar coming up in July and the addition of perhaps hundreds of new, additional would-be distributors, won't this cause even greater delays for us???'' asks another concerned investor.

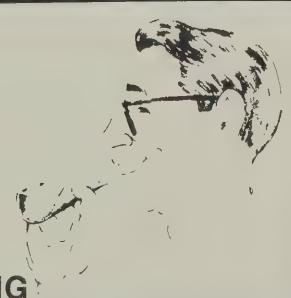
Let's survey what is practical. The 'major' antenna/receiver/LNA producers have been recently surveyed by their trade press and the feeling is that bunch of suppliers can provide perhaps 200 brand new terminals per month. This 200 new terminals will go to the cable industy (both first-time terminals and now that Cable Net II seems alive, second terminals for many), to motels and hotels installing terminals, educational institutions, broadcasters and so on. At the 200 per month rate there won't be much of a surplus around for our 'private' industry even if our 'private industry buyers' are somehow willing and able to pay the big ticket prices that go with the commercial gear. Let's be fair however - let's assume optimistically that 20% of the major's 200 terminal per month production capability could be purchased in the 'private' market. That's 40 terminals per month.

Now let's look closer to home. If one fairly assumes 750 complete terminals were ordered at SPTS Miami, that translates to a 120 day delivery span of 4 months or 187.5 terminals per month. If we deduct the optimistic 40 per month which **we suggest** the majors could dispose of in our marketplace without infuriating their high ticket customers, that leaves us with just over 147 per month we need to produce on our own. Can we do it? Probably not.

In the antenna field we have Paraframe, Star Antenna, Starview Systems (H & R), Lindsey, ADM, and Chaparrel. Evenly split that is 24.5 antennas each per month. Or roughly one per day. But the orders **won't be** evently split; Paraframe has a high dollar product, Lindsey has to be shipped across the Canadian border and so on. Still, antennas are in better shape than receivers. In receivers we have AVCOM, ICM, Ramsey Elecronics and AB Electronics (VHF Engineering). That works out to 37 radios per month each. It could be done...but not this month and probably not next.

Where does this leave us? If you are a would-be-distributor, probably frustrated. You **want** to get into business but you can't. You **know** the market is there...possibly huge, certainly large. Unquestionably larger than the supply lines in place to fill it. Now, how do you get the gear out of the manufacturers????

CSD PROGRAMMING



COOP'S SATELLITE DIGEST (Programming Section) is produced monthly by Satellite Television Technology, P. O. Box G, Arcadia, Oklahoma 73007 (USA); 405-396-2574. **CSD** is not affiliated with any satellite programming source, hardware (equipment) manufacturer or distributor, nor satellite systems operator. STT does produce a weekly television program called **Satellite Magazine** which is distributed free of charge to viewers via RCA SATCOM FI at 12 noon eastern Thursdays on (SPN) transponder 21. Subscription rates to **CSD** are $50 per year for US, Canada and Mexico delivery; $75 per year outside (all via first-class/air mail). All subscriptions must be paid in advance in US funds; no invoicing. Contents copyright 1980 © by Satellite Television Technology.

INTELSAT

THE MORE WE KNOW — THE MORE WE DON'T

AFTER BRASILSAT...

The hypertension radiating throughout the Miami SPTS '80 gathering with the news that small (4 and 5 meter) dishes had brought down reasonably good quality signals from INTELSAT'a IV-A FI bird spread rapidly worldwide. Before too many people get too many ideas about what it is they think they can do with INTELSAT signals anyplace in the world we would all do well to carefully analyze the existing operational parameters of the INTELSAT system.

The operating parameters of the INTELSAT system are fairly widely known. The STT wallchart of Worldwide Communication Satellites tells us that the typical IV-A birds (there are some seven in the 'A' series and another seven in the straight 'IV' series) have carefully prescribed operating characteristics. Unfortunately there tends to be a wide range of operating charactistics in the **real** INTELSAT world and the wallchart data (it turns out) is more 'best case' than 'real case'.

Getting accurate data about the true operating condition of INTELSAT birds is difficult; perhaps impossible unless you have access to internal COMSAT records. There is reported to be a complete computer printout available to INTELSAT or COMSAT operations personnel that shows such things as the current operating condition, load (i.e. type of use), service hours and so on for each INTELSAT bird in the sky. Such a printout is reported to be updated monthly but unfortunately it is simply not available to the public (meaning you and I).

Therefore to put together a completely accurate picture of the current operating condition of any single INTELSAT bird, or any combination of INTELSAT birds requires a great deal of luck (and cooperation from informants) or a willingness to accept something less than complete data. We'll do our best given the shortage of verified data in this report.

NOT ALL EQUAL

INTELSAT IV birds are 3,120 pound satellites, spin stabilized, built by Hughes. They measure approximately 8 feet in diameter and are 17 feet high. Each is equipped with 12 transponder channels, 36 MHz wide. Under fully saturated conditions (i.e. the uplink signal into the satellite in the 6 GHz range is operating at a level to produce the maximum possible output from the downlink transponder) the IV satellites are **supposed** to produce minimum EIRPs of:

Global beam (which sees approximately 40% of the earth's surface) = **22 dBw**

Spot beam (available on two transponders, one with an eastern hemisphere spot and one with a western hemisphere spot) = **33.7 dBw** at boresight.

INTELSAT IV-A (the later series of the IV birds) are 3,340 pound spin stabilized satellites approximately 8 feet in diameter and some 23 feet tall. Each is equipped with a total of 20 transponders but only 12 can be operational at a time (36 MHz wide). The **global beam pattern** when the input is fully saturated **is 22 dBw** while there are potentially 4 transponders capable of operating in either eastern or western **hemispheric patterns** at fully saturated output levels of **26 dBw.** These satellites also have spot beam potential at the 29 dBw level.

The INTELSAT locations generally **publicized** are given in table one here. However while these are the 'reported' locations the true locations may vary slightly in some instances; as we are learning as we develop greater interests in the INTELSAT system. Other than Steve Birkill's work from Sheffield, England where he has been able to recover video utilizing his reduced bandwidth PLL (phase lock loop) system on a number of transponders, not a great deal of 'observer' activity has been conducted with the INTELSAT feeds; largely because where there is the most low-cost satellite terminal activity (within North America) the Canadian and US domestic satellites provide much more comfortable signal levels and easier targets. The limited success during SPTS '80 in Miami may indicate a change in this interest level, especially in the Caribbean and throughout central and South America.

THE BRASILSAT CASE

Brasil, like many of the countries utilizing INTELSAT, looks to INTELSAT as a (possibly) temporary substitude for having a domestic satellite system of their own. Since a single domestic bird, built and launched into position, carries a pre-bird price tag in the $50 to $70 million region (plus as much as 25 million for ground control and 'flight control' equipment and stations) the decision to launch a satellite on their own is not taken lightly by the lesser developed nations of the world. And since one satellite is risky (a back upbird is a necessity, usually in space with the primary bird) the true system costs for the uplink plus launching of a pair of birds really begins to look like a $150 million investment. And that is before the downlink terminals to receive the transmissions are included. If a nation only has to feed signals to the INTELSAT bird (as in having an uplink station) and take down (i.e. receive) the appropriate feeds, they can be in the satellite business for far less money; typically under $5 million, even with INTELSAT standard terminals. And when a nation only requires a **single** transponder, **or a part of one**, the cost effective decision is to go with INTELSAT since even with a 12 channel domestic bird a major portion of the bird's capabilities are lost or under utilized. On a cost-per-year basis, INTELSAT simply makes the most sense; even with the annual transponder rental charges of INTELSAT.

Because the (typically) 36 MHz wide transponders (same as domestic birds) are in a sense 'toll roads in the sky' INTELSAT encourages maximum utilization of each transponder. One way they do this is to push users requiring TV relay to utilize something called the 'one-half transponder format'. With this approach the 36 MHz wide channel is divided in half (i.e. it becomes **a pair** of 18 MHz wide transponders) and then with careful uplink engineering and control two separate video signals can utilize each half of the transponder independently from the other. Brazil does this with their utilization of INTELSAT IV-A FI located at 25.5 degrees west. The Brasilian video transmissions occupy the lower half of transponder II (the center frequency for their video carrier is 4143.0 MHz). This is the signal which the crowd at SPTS '80 Miami witnessed February 6th and 7th.

As noted earlier the power levels available 'on the ground' are nominally rated by the type of antenna beam being utilized. A '**Global Beam**' is similar in concept to an omni-direction antenna system for terrestrial use; the satellite using such a beam sprays signal onto all of the visible earth it can 'see' from the particular Clarke Orbit location; roughly 40% of the total earth's surface. Some transponders in both IV and IV-A satellites have the capability of being commanded into the other relatively common antenna configuration; hemispheric beams. In a sense the hemispheric beam sees approximately 50% of the global beam's area. For example, Brasil operates transponder II (half channel format) IV-A FI on a 'west up/west down' configuration. That simply means that t antennas receiving the 6 GHz range uplink signals and the antennas re-transmitting the 4 GHz range downlink signals have been directionalized by ground command to respond to that portion of the globe visible from 25.5 degrees west **to the west only**. See map figure one.

Brasil actually leases the full capacity of transponder II (in our example) but they choose to utilize only 50% of it for television. The other half, in this case, is utilized for telephone/data/narrow band communications and in Brasil's

instant case only perhaps 3 MHz of the remaining 18 MHz is so utilized. In effect Brasil has room to grow within its transponder II and could add additional narrow band channels (or on a temporary basis remove them entirely and run two separate and simultaneous TV transmissions).

POWER USE

As noted there are nominal published power (EIRP) levels for the INTELSAT satellites; i.e. under **ideal** conditions on a hemispheric beam you can expect 26 dBw coverage in the **worst** case.

Because the lifetime of the bird is affected by how much of its available power it utilizes how much of the time (i.e. operating a single transponder at a reduced output will usually lengthen the lifetime of the critical Traveling Wave Tube - TWT - output transmitter stage) INTELSAT encourages users to very carefully monitor their uplink power utilized to access the bird. Why is this? Remember that the individual transponders are really 'linear translators'. That means they repeat at the output (4 GHz) whatever arrives at the input (6 GHz). The **amount** of uplink power required depends upon the amount of downlink signal (i.e. EIRP power level) required. In other words, if the downlink receiving installations are employing large antennas, the uplink power can be 'backed off' and the circuit will still maintain a high signal to noise ratio. Conversely, when relatively small antennas (and non-cooled LNAs) are utilized at the downlink sites, the uplink power can be increased up to the point where the transponder 'saturates' (i.e. any further increases in uplink signal will not result in a corresponding increase in transponder downlink signal power).

INTELSAT, as noted, is very 'power conscious' which simply means they don't operate their transponders at anymore output power than the circuit requirements dictate.

NOMINAL INTELSAT LOCATIONS

While internal-to-INTELSAT data indicates that all of the IV and IVA series satellites are no longer precisely where previous published data says they should be, here is a table of that data. If you are utilizing a mount that allows you to adjust elevation angle on a single bird in the cluster for optimized reception, chances are you can then use a elevation siting tool on a flat surface on the rear of the dish to read-out the apparent elevation from your location. Utilizing this table, you should be able to search the sky + /- 10 to 15 degrees either side of your 'found' INTELSAT bird to pinpoint the locations of others in the cluster.

Satellite Number	Longitude
I-IV-F3	34.5W
I-IV-F4	179 E
I-IV-F5	60 E
I-IV-F8	174 E
I-IV-F1	121 E
I-IV-F2	4 W
I-IV-F7	1 W
I-IVA-F1	24.5W
I-IVA-F2	29.5W
I-IVA-F4	19.5W
I-IVA-F3	117E
I-IVA-F6	120E

This is another way of saying that INTELSAT engineers encourage users to put in **large receiving installations** (i.e. big antennas at the downlink site) so that in turn the transponders can be operated at reduced output power levels. And in fact a

INTELSAT IVA-FI - 24.5 [25.5] Degrees West

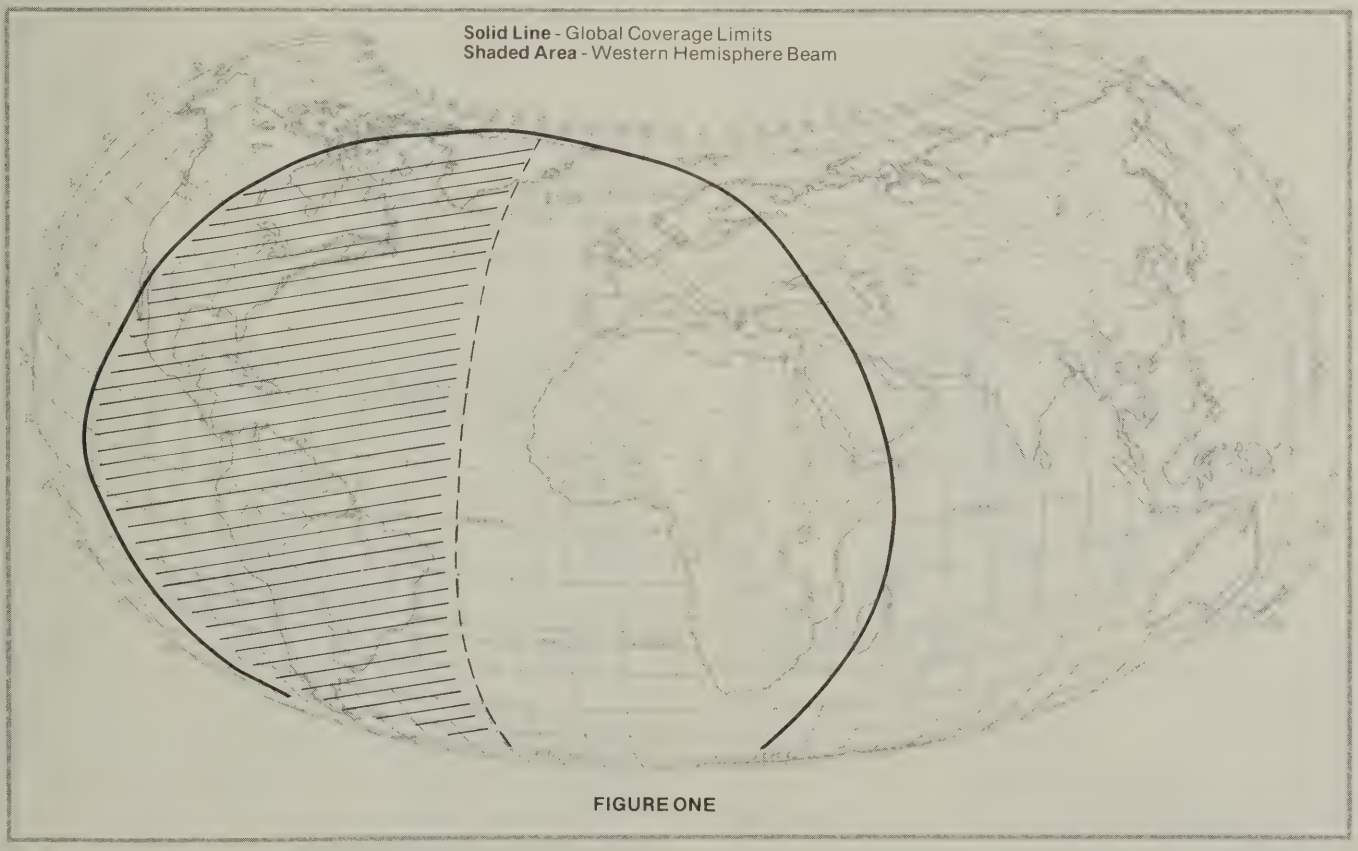


FIGURE ONE

considerable amount of INTELSAT engineering time is spent monitoring the power output levels of the various transponders in use and they actually 'police' the efficiency of the system on a daily basis.

Because of this 'reserve capacity' philosophy INTELSAT systems have remained very expensive to implement. The 26 dBw hemispheric beam transponders, for example, are certainly capable of delivering high quality television to ten meter (or slightly smaller) size antennas and while ten meter antennas are not inexpensive (they currently go for between $35,000 and $50,000 each) they are far less expensive than some of the 15 to 18 meter antennas which INTELSAT largely **encourages** users to put into service. And as SPTS Miami indicated, given a 26 dBw region hemispheric beam even antennas in the 5-7 meter class are capable of producing good quality (if not perfect) video.

GLOBAL USE

Television relayed by INTELSAT falls into two general categories. The first category is per-event-feeds; television relayed from the point of origin to one or more receiving points for the duration of the event only. The evening newscasts on the American and Canadian networks typically have several such 'events' fed to the network control center earlier in the day of broadcast. Sporting events, such as soccer, are another frequently noted type of programming in the 'per-event' category.

Per-event programs are typically sent via an INTELSAT Operated uplink through the appropriate transponder to a INTELSAT operated downlink. Terrestrial inter-connection on both ends of the circuit then completes the connection to (in the US case) the appropriate network control center. Because the downlink receiving station is an INTELSAT 'network' station, it is typically a large antenna with an extremely low noise (i.e. 20 to 40 degree K) cooled LNA. This simply says that the power-conscious (efficient minded) INTELSAT is not apt to run their uplink site transmitters at very much power during such a feed. Under these circumstances the program feed is apt to come back to earth at EIRP levels considerably below the 22 dBw normally considered as the operational plateau for global beams or 26 dBw for hemispheric beams.

The other category of programming one finds on INTELSAT is the domestic (i.e. **intra**-country) feeds typified by the BrasilSat service found on IV-A FI. In this situation the uplink and downlink sites are typically planned by the nation that is utilizing the system internally and they may create 'link power budgets' that suit their particular needs; with less attention to the INTELSAT desire to keep downlink terminals big and transponder EIRP down. Such feeds are more apt to be on a scheduled feed basis versus the per-event feeds typifying the first example. For example, a whole day's programming or a portion thereof is transmitted via INTELSAT. If there is news on the terrestrial system each day at 5 PM local time and sporting event each day at 6 PM, the INTELSAT use will parallel that feed. This type of domestic use of INTELSAT is quite popular in Africa and is starting to become more popular in the middle east. Some of these national users have been utilizing INTELSAT feeds as a temporary solution to a problem which they plan to eventually resolve with domestic satellites of their own, or with 'regional' multi-domestic satellites. Brasil, for example, has been alternately interested and dis-interested in designing and launching their own domestic satellite system for nearly six years. A consortium of North African and middle eastern nations have likewise been alternately interested and dis-interested in creating something named Arabsat; this would be (if indeed it comes off) a sharing of a satellite system designed to serve multiple nations in the same area of the world. Such a concept is already in operation in Indonesia where the Palapa series of satellites (2 birds) which were initially intended for use by that nation for intra-country service has begun to be shared with other nearby nations. The reason is obvious; lesser developed nations seldom require all of the capacity (of even a 12 transponder satellite) and in some instances can justify a satellite communications system only if they can share the system expense with other nations.

Some of the nations employing INTELSAT for intra-nation relay (of television, telephone and data) **include** Algeria, Nigeria, Sudan, Zaire, Uganda and soon Libya.

One of the side benefits to engaging in a domestic or regional multi-nation domestic satellite system are obvious. By confining the coverage pattern to a segment of the visible earth (i.e. something less than the global beam of INTELSAT or even the effective one-half-global beam of the hemispheric pattern) EIRP levels come up and both the uplink power requirements and the downlink antenna size (G/T) requirements come down. Since 4.5 meter receive-only terminals can be constructed for as little as 1/10th the cost of dedicated 10 meter terminals the nations employing such an approach are able to get more terrestrial ground coverage dollars for their money invested.

How do such nations utilize these INTELSAT feeds, for domestic service? Obviously they are not transmitting television programs to **individual** receivers (i.e. small aperture home receiver sites) with INTELSAT power levels. This is not a 'broadcasting satellite' service. The uplink site is typically located at a central program origination center (such as the nation's capitol) and the programming transmitted may be the normal over-the-air television released through standard broadcast transmitters for that portion of the country, or, it may be special programming created for the satellite feed (the Canadian ANIK-III system is an example of the latter while the ANIK-B 12 GHz fed channels of CBUT and CHAN is an example of the former). At the receive sites the downlink antennas recapture the satellite relayed signal and typically feed it directly into a (VHF or UHF) terrestrial transmitter. The 'viewers' then are simply watching off-the-air television, relayed to them via satellite but transmitted in their local area by a normal terrestrial transmitter. This type of service may on occasions be intended for non-contiguous portions of a nation such as the Spain feed of the TVE network to the Canary Islands.

GIVEN THESE CONSIDERATIONS...

With the power efficiency concern of INTELSAT plus the transponder rental charged by INTELSAT to users there is give

SATELLITE TV EXPERIMENTERS
INTRODUCING A COMPLETE
3.7 — 4.2 GHz DOWNCONVERTER
•3.7-4.2 GHz in, 70 MHz out
•Remote, one control tuning
•Dual cor rsion - stable
•Assem tested Only $895.
Polar Remote Feed Rotation
our Dish.
postpaid
UPPLIES
•Te tant 2.55
1/16
1/32"x
•Chip capa 27,
39, 220, 470
•SMA and micro
•2"x14" copper tu , 3 lbs.
$12.00
WRITE - We are adding our inventory!
SATELLITE INNOVATIONS
P. O. Box 5673
Winston Salem, N.C. 27103
Add $2.00 shipping and handling (except for plans)
THIS PRODUCT NO LONGER AVAILABLE

and take on both sides. Since a good quality TV signal can be transmitted with reduced modulation indexes (i.e. the so-called 1/2 transponder format modulates to a maximum deviation of 17.5 MHz) this encourages nations such as Brasil to lease something **less than** a full transponder for video. In Brasil's case they do lease all of transponder II on IV-A F1 but they then utilize the second half of that transponder for narrow band services (in Brasil's case their present use of the 'second half' of transponder II centers on 4136.5 MHz, they utilize but 2.5 MHz of the space with approximately 36 narrow band service channels).

Some nations lease only half of a transponder and only transmit video. Libya's 1980 start-up system is an example of this. Other nations with no video requirements lease even less than half transponder from INTELSAT; Egypt, for example, recently indicated it wishes to lease 1/4 transponder for what will be narrow band service connections. In our hemisphere Chile leases a part of a transponder largely for telephone traffic (transponder II on IV-A F4 at 30 degrees west).

Most of the present 'continuously-up' traffic on INTELSAT is in fact non-video. Narrow band services require lower EIRP levels for 'noise-free' reception and this use again allows INTELSAT to design the system so that the transponder can run at 'backed-off' (meaning reduced) transponder power levels. Why is this worth mentioning? Because as you dial through the INTELSAT channels you are likely to find that the power levels present vary considerably from transponder to transponder even when they are operating in the same antenna pattern configuration (i.e. all global for example). Each user (with the guidance and agreement of INTELSAT) configures his own uplink/downlink 'power budget' to suit both his service needs (i.e. whether narrow band or wideband video) and his system engineering requirements (i.e. whether the service is being utilized by 'small' (in this case 10 meter) receive antennas). Algeria's total of 14 terminals are all 10 meter, for example.

While INTELSAT has available global, hemispheric and 'spot' beams a recent survey of the actual in-service transponders revealed that generally speaking hemispheric beams are not widely used; again the power consciousness of INTELSAT engineering. The most common transponder for video for per-event relay is transponder 12 and this has a (1/2 transponder) video center frequency of 4184.25 MHz. The Pacific cluster of INTELSAT birds (two, one in operation at 174 degree east / 186 degrees west and the other in reserve status at 179 degrees east / 181 degrees west) is typical. While it is possible to configure on command from the ground virtually any transponder to carry any type of traffic, the video-use transponder (12) is quite universal for that 'dedicated' purpose worldwide. As noted the video center frequency for transponder 12 is typically 4184.25 for the higher half of the split transponder and the center frequency for the lower portion is 4165.75 MHz. What about full-transponder video (i.e. utilizing the full 36 MHz)? It is very seldom utilized.

The spot beam option is also seldom utilized. Where perhaps 90% of the transmission services are operating on the global beam, even the hemispheric beam is the exception. So what does this mean relative to expected EIRP levels in various segments of the world?

First of all, EIRP levels are always link-budget conscious. Take the utilization of transponder 8 on IV F8 located at 174 degrees east. There are presently approximately 130 channels of narrowband data on this transponder in a 10 MHz bandwidth. The power level radiated is in the **19.5 dBw region** in the global beam (rather than the 22 dBw the system is capable of) simply because of the link-budget which includes the gain and G/T of the receive terminal(s) associated with this particular transponder.

Global TV transmissions on (typically) transponder 12, widely utilized for per-event feeds, may be powered-down even more severely (again a function of the G/T of the receiving site). On IV-F4 (18.5 degrees west) for example, widely utilized for cross-Atlantic news feeds, the 'nominal' (i.e. maximum) operating EIRP is characterized as 22 dBw while the recent operating EIRP has been in the 17 dBw region.

What does all of this tell us? Simply that unless the INTELSAT channel you are after is on a hemispheric beam pattern, and you are located in the 'correct' hemisphere, you won't repeat the SPTS Miami results! Let's look more closely at what the Miami 'pioneers' were apparently working with when they produced 5.5 to 6.0 dB CNRs with the 5 meter Paraframe antenna plus 120 degree K LNA and the H. Paul Shuch Microcomm 'next-generation' TVRO receiver.

1] The video was operating in a **1/2 transponder** format centered on 4143 MHz.

2]Audio was **subcarrier** at 6.6 MHz.

3]The transponder and antenna configuration was for a 'west up' and a 'west down' **hemispheric** pattern. That means the system was looking at the western portion of the 'visible portion of the earth' and the signal level in Miami would be very similar to the signal level in Brasil proper.

What about the EIRP level? Apparently the Brasilian receive terminals associated with this feed are on the 'skinny side' when it comes to G/T since INTELSAT data indicates the EIRP would be in the 26.5 dBw region. Yes, that is approximately 0.5 dB **above** the reported 'nominal-maximum' one could expect from INTELSAT on a hemispheric beam.

The receivers connected to the Paraframe antenna for this experiment were all designed for domestic service. One (the AVCOM) utilizes a conventional discriminator while the balance (VHF Engineering, Shuch prototype and the ICM production unit) all use PLL demodulators. As was noted, the PLL receivers produced superior pictures on this below-threshold carrier level. None of the receivers had 17.5 MHz IF bandwidths which simply means the receivers could be expected in the best case to recover perhaps an additional 3 dB of video SNR (signal-noise ratio) if they had optimized IF bandwidths for the one-half transponder modulation index. And also this reminder - INTELSAT transmissions are all circular polarized and when you receive such a transmission on a linear (whether vertical or horizontal) feed 'probe' you immediately give up 3 dB of received signal 'power' by seeing only 50% of the incoming wavefront.

It turns out that apparently the only **western** hemispheric pattern signal over the Atlantic at the present time, on a **regular** basis, is the IV-F1 signal on transponder II utilized by BrasilSat. In other words, in Miami, the 'INTELSAT pioneers' found and recovered the only such signal that was likely to be seen even if a search had been conducted through all (five) of the INTELSAT Atlantic birds 'visible' from Miami. Some would say the Miami crowd was frightfully lucky!

What about hemispheric beams looking in other directions? Information is scarce at the present time; INTELSAT operations continues to guard the data closely. However, there are some obvious examples known. Spain's TVE feed on transponder 7 of IV F4 (30 degrees west) is on an east/east hemispheric beam (east looking uplink antenna and east looking downlink antenna). What is the EIRP level on this service? Hard to say but one knowledgeable source indicates it does not exceed 23 dBw (although Steve Birkill's observations in Sheffield, England suggest it may indeed be closer to the 26

FOR YOUR EARTH STATION, CHOOSE

AVCOM'S PSR-3

SATELLITE VIDEO RECEIVER

DESIGNED FOR YOUR PRIVATE TERMINAL

- Remote tuning
- Dual video outputs
- Exclusive Clamp-Sync & Scan-Tune
- Many other features!

AVCOM of Virginia, Inc.
10139 Apache Road, Richmond, VA 23235
(804)320-4439

dBw region of BrasilSat). The Spain service, incidentally, is something of a benchmark in the sky since it is in service every day and is highly reliable at 3984.25 MHz. The important thing to keep in mind with any hemispheric pattern is that the hemisphere is divided along north-south lines with everything east of the satellite being the eastern beam and everything west being the western beam. This means that the eastern hemispheric pattern for Spain's TVE feed is at the same level in southern Africa as it is in Spain or the Canary islands even though they are on opposite sides of the equator.

BOTTOM LINE...

Much less is really known about INTELSAT than is known. The US/Canadian domestic satellite systems are relatively well understood and through several years of editorial 'prying' many of the details have appeared in print and been updated as conditions changed. INTELSAT has greater bird flexibility with the ability to change antenna patterns on several transponders per bird and to activate less than full transponder formats. And perhaps of greatest importance, because the power budget for every user is carefully controlled and calculated the actual EIRPs present can vary over a range of perhaps 5 dB downward from the published (i.e. 'nominal') levels. All of this says that INTELSAT watching on other than dedicated feeds (such as TVE, BrasilSat and others) may be out of the reach of truly small terminals for now.

Do remember that any INTELSAT signal you intercept with video is going to be circularily polarized and probably operating on a half transponder format. And this says that if you can get even a set of 'sync bars' with a linear feed and a standard IF bandwidth receiver that by improving the system to include a circular polarized feed (such as the Birkill Hybrid Mode feed described in the February **CSD** / Technical Section) you can pick up 3 more dB (and start to begin watching a picture). Furthermore, if you will then work with the receiver IF bandwidth (to narrow it down to the 17.5 MHz point) you probably can pick up additional dB or two of video SNR. The PLL demodulators originated by Steve Birkill and Taylor Howard have the capacity to semi-automatically reduce their own demodulator bandwidth to the video bandwidth present. In some circumstances when you start off using a receiver with such a demodulator system you will not realize the full SNR improvement normally associated (in theory) with reducing the IF bandwidth of the system.

One other note worth remembering. Because the normal INTELSAT video is operating at a 1/2 transponder format, a switch tuned (i.e. preset channel by channel) tuning system may not be as functional as a continuously tuned receiver. **Why?** Simply because the **half** transponder video signal is always going to be **above or below** the **center** frequency (i.e. 18 MHz above and below the center of the channel to which the radio's pre-set tuning is calibrated). This says that if you are going to be recovering with maximum efficiency all of the video information present, with a reduced IF bandwidth system tailored for the INTELSAT service, you really need to be able to 'fine tune' (as in continuously tune) the spectrum.

INTERVIEW WITH COOP

While CSD attempts to deal with the burning issues of the day through both feature reports and the publication of letters to STT/CSD, the lingering effects of a gathering such as the recent SPTS '80/Miami suggests to us that not all of the desired information is getting into print. Recently two organizations with a desire to share Coop's experience and knowledge in this field visited STT to interview him. Representing **Mother Earth News**, Associate Editor Peter Hemingson spent the better part of a day with Coop talking about and transcribing views on the history of television broadcasting in this country and the future of satellite television 'narrow-casting'. A few days later the Japanese Broadcasting Network **NHK** spent a full day at the Coopers preparing a special program which was to air in Japan during prime time late in March. STT took the opportunity of both visits to do a little coverage of our own, videotaping for use on our Satellite Magazine program the NHK visit and transcribing for use here some of the conversations with Mother's Peter Hemingson. An abbreviated text of the two interviews, as if they were one, appears here.

NHK: How do you explain the American phenominon of low cost satellite television equipment?

Coop: Individual initiative. In fact the low cost satellite revolution is totally the result of individual people working on their own projects and then sharing their results with others. Taylor Howard, for example, built a terminal for his own use. He did it because it was a challenge to see if it could be done. Then through us he agreed to share his experience and knowledge with others.

MOTHER: How much longer can individual initiative lead this evolution? Isn't there the liklihood that low cost earth terminals will become so widespread and such a success that major firms will recognize the potential of this market and jump in, pushing the individual entrepreneur such as Howard or Coleman aside?

Coop: Certainly at some point that will happen. But I have this theory that tells me that as long as the 4 GHz satellite service continues to have these program access legal clouds hanging overhead that most major firms will stay out of the business.

MOTHER: I am confused how people can dis-regard the legal questions that apparently do, as you say, cloud the right to access programs, and charge ahead building and selling terminals.

Coop: It doesn't baffle me. Taylor Howard is not General Motors and he doesn't have that corporate legal staff telling him to go slow because there are unresolved legal questions. He continues to be challenged by just doing it; he is an engineer's engineer. He sees a challenge to design a box to do a specific task and he sees people interested in what he is doing. So he just does it.

NHK: In Japan virtually all research and development is carried out by large corporations. Often the seed money for this will come from government or quasi-government agencies. Our BSE satellite, for example, may have been launched just so our electronics industry would then be placed into a position of designing and producing low cost receiving hardware for 12 GHz. Yet here in America there seems to be no government incentives in this area at all.

Coop: Certainly there are no direct incentives such as grants or funding. But in a sense when our FCC decided last October to deregulate receive only earth terminals, that provided a form of incentive. Prior to last October 18th an earth station had to be licensed to be built. By eliminating that mandatory licensing a major element in the murky legal structure overshadowing all that we are attempting to do was eliminated. I think that was a direct incentive to individuals and corporations to get busy developing the technology we are now seeing.

NHK: Yet there are many major firms, certainly firms large enough to produce large quantities of receiving systems, already in this field. Firms such as Scientific Atlanta,

Microwave Associates, Microdyne and Gardiner all have been selling hardware in this field to the commercial users for several years. Why aren't they aggressively entering this private marketplace since their product lines and manufacturing facilities are already established?
Coop: Largely because of pressures on their existing production capabilities and pressures from their existing customers. My intelligence tells me that if you add up the production capabilities of all of the major suppliers in this field you come to fewer than 1,000 new TVRO **radios** per month. The commercial installations, meaning the cable firms, hotels and so on, typically now install around 5 **separate receivers** at each receiving site so as to be able to handle that many simultaneous program channels. Working backwards, that says 200 new commercial **terminals** per month. In my estimate the flat-out production capabilities of the receiver suppliers in the commercial field just about presently equals the demand of that segment of the market. At best there may be 200 extra receivers per month left over.

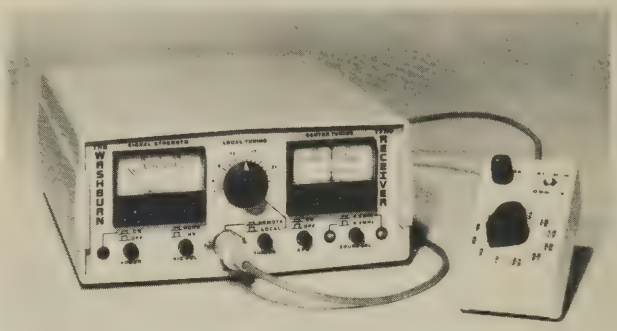
MOTHER: That brings up the questions of receiver differences and pricing. We see private terminal receivers priced as low as $1800 for a 24 channel tuneable receiver. Yet the commercial radios are as much as 2 or 3 times that amount. What is the real difference here?
Coop: Surprisingly little. There are refinements on the commercial radios and greater safety margins. However given an adequate signal level from the antenna and LNA you can stack two radios, one intended for commercial and one intended for private, side by side and the pictures will look almost or exactly the same.
MOTHER: Why do cable and other commercial buyers spend more money for receivers when these lower cost units are available then?
Coop: Pride and sales packaging. Their pride keeps them from buying what they believe is an inferior product. Sales packaging, meaning the whole package of LNA, antenna, receiver plus add-on equipment that is only required for commercial installations, is often done in such a way that if a buyer elects a Scientific Atlanta TVRO for example he can then obtain some pricing discounts on regular CATV hardware also purchased from SA.
NHK: I am confused by the Scientific Atlanta attitude. Didn't they initially say they were going to sell private terminals through a subsidiary called HOMESAT? And then they seemed to get totally out of the business.
Coop: They did and I believe they left the private market because of a combination of factors. The most significant factor may well have been the pressures they were feeling from commercial buyers.
MOTHER: What kinds of pressure?
Coop: Well, I haven't been there to hear it; all I have heard is second or third hand reports. Basically it appears the cable buyers in particular have let SA know that if SA is attempting to sell on both sides of the fence...that is, to commercial users and private users, they can forget about selling to the commercial field.
MOTHER: Why should the commercial users have this attitude?
Coop: Paranoia. When the first cable satellite installations were installed in September of 1975 and HBO became available via satellite the cable industry got the biggest shot in the pocketbook it has ever had. The satellite revolution to cable has met the difference between a ho-hum industry growing slow but steady and an industry that has taken off like a rocket. The value of cable systems has doubled or even tripled in recent years strictly because of the additional cash flow that satellite signals create for cable systems. So we have around 4,500 separate cable systems all dependent upon their 'exclusive-by-cable' services from satellite who recognize that the sudden increase in the value of their businesses is a function of their having exclusive access to the satellite signals. Private terminals represent a wedge on that exclusivity. It doesn't amount to a hill of beans yet. But someday it might and that scares them to death.
NHK: This fear then is extending to the suppliers?
Coop: Definitely. Didn't you have an example of that when you tried to interview some people at SA?
NHK: Yes, we were in Atlanta to visit with Ted Turner and while there we attempted to visit Scientific Atlanta. We wanted to interview some of their people and to videotape some of their operations.
Coop: And what happened?
NHK: We were told that we would not be permitted to interview anyone and that we could not videotape anything there. They acted as if we were spies!

MOTHER: That raises the question of what will happen offshore with the equipment. If the US manaufacturers are operating at full bore to supply the commercial market and it appears the newly formed firms that are attempting to sell terminal equipment to private users are at best small in size and production capabilities, isn't that exactly the scenario needed to bring someone like the Japanese into the marketplace?
Coop: I think it is only a matter of time. Again, though, I see the murky legal picture having some calming effect on the ultimate decision by any major offshore producer to jump into this market. Perhaps the legal questions will not be as big a consideration for say a Japanese firm as they might be for a US firm, but they remain none the less. All it takes is one decision to change that situation. I believe that when the first offshore producer decides to risk the fallout that is sure to come when thousands of truly low cost terminals start entering San Francisco harbor all sorts of things will happen.
MOTHER: Such as...?
Coop: Well, we'll have great cries of anger from the established US commercial suppliers. They'll bombard Congress with requests that these 'illegal receiving units' be banned from distribution in this country. We'll have Congressman standing up and reading into the Congressional Record their beliefs that our whole national system of FCC regulated broadcasting is in danger.
NHK: And then what?
Coop: If I were directing an offshore firm I'd avoid that scenario from the beginning. First of all I wouldn't even call the terminal hardware I was importing into the United States 'private'. I'd announce it as a 'breakthrough' in high quality **professional** hardware designed for the **commercial** market.
NHK: What would that do?
Coop: Commercial systems have no murky legal problems. The cable firms and others have clear contractural rights for the programming available on satellite. This is why SA and others have no problems in that area. By promoting what they should call low-cost-but-professional, as in high quality, equipment directly to the commercial market they will avoid the pitfalls of scaring up a mad Congress.
MOTHER: But how does that help them sell the hardware in the private sector?
Coop: Simple enough...while I strongly disagreed with what happened or how it happened, there is ample precedent in the CB field. Some years ago a number of reasonably high quality Japanese amateur radio transceivers were introduced here under the guise of being ham radios. In truth they were being sold at a 10 to 1 or higher ratio to CB enthusiasts. I am told that even today, years after the bloom has fallen off the CB rose, that for every Japanese ham radio transceiver sold to an end ham user that several are sold to an end user CBer. Yet clearly these radios are totally illegal for CB use.
MOTHER: In other words, call it what you want and then let the marketplace decides who buys it?
Coop: Precisely.
MOTHER: Are you in favor of such a subversion of the law?
Coop: What law? There is no law at the present time. What there is out there is a lack of law.
MOTHER: Well, let me re-phrase the question. Are you in favor of abdicating the American developed marketplace for low cost satellite hardware to offshore producers?
Coop: Not at all. I am trying to give my views on what I think is inevitable as long as we have this split marketplace where the large firms who **are** capable of seeing that this does not happen refuse to become a part of this marketplace. I think that they are the ones who will ultimately abdicate the marketplace to offshore producers. This is such a potentially huge market, not

THE WASHBURN TVRO RECEIVER

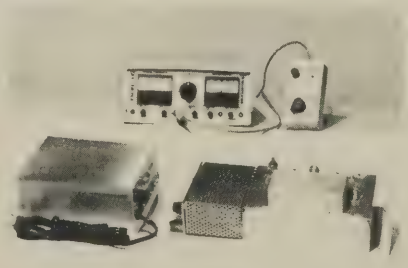
The WASHBURN TVRO RECEIVER is a complete, high performance unit which provides excellent quality picture and sound reception from television satellites. The easy to operate format makes the WASHBURN receiver ideal for any application where non-technical users are encountered, such as the home, job site or resort. Advanced state-of-the-art, technical features such as; extended threshold demodualtion, full band width video and wide range AFC insure professional quality performance for years to come.

The WASHBURN, receiver of the 80's!



STANDARD FEATURES:

- ***EXTENDED THRESHOLD***. . .a state of the art approach to threshold extension that allows sparklie-free reception of program material with CNRs of 8 dB and above, achieved with-**out** compromises in IF bandwidth or video bandwidth and with special design attention to maintaining video phase and amplitude linearity as one would expect to find in a high dollar commercial receiver package.
- ***LOW DISTORTION AUDIO***. . .a unique approach to recovering **all** of the audio bandwidth present on the satellite transmission utilizing a true low-distortion, low-noise, high fidelity audio output with remote control and **automatic** selection of either the 6.2 or 6.8 MHz sound subcarriers; with indicators to show which audio subcarriers are present and a priority selection system so that the presence of some other modulation format (such as slow scan video) on 6.2 MHz will not be selected for listening (but a **normal** audio modulated subcarrier on 6.2 MHz on a different transponder **will** be heard.) Additionally, CCITT (or ANIK) subcarrier frequencies different from the normal 6.2 and 6.8 MHz North American DOMSAT bids can also be received and deemphasis supplied by component value changes.
- ***HIGH PERFORMANCE AFC***. . .that works as well as the RCA home receiver Colortrak® system and provides a very high overall level of dispersion cancellation, eliminating any need for a complex and expensive frequency synthesis system.
- ***AUTOMATIC AND PRECISE***. . .feed rotation control using a readily available, modest-in-cost (TV) antenna rotor assembly.
- ***FULL FUNCTION METERING***. . .dual meters to show received signal carrier to noise ratio (CNR) and AFC center tuning. Meters calibrated directly in db and MHz.
- ***VTR COMPATIBLE INPUTS AND OUTPUTS***. . .to provide easy back-feeding of a home (or neighborhood) MATV system, plus simple off-bird-recording without additional switching or complex cabling.
- ***PROFESSIONALLY DESIGNED AND MANUFACTURED***. . .utilizing an out-of-the-way down-converter (mounting separate from the demodulator proper) with an LNA power supply, a feed rotation system (to allow operational remote control of the feed point antenna for separate reception of vertically and horizontally polarized transponders), a small demodulator console with full provisions for constant monitoring of the system performance, and, a hand-held remote control that allows the viewer to adjust the system to each of the 24 channels found on SATCOM birds (or alternately 12 or ANIK, WESTAR birds) with a remote control. This design allows operation by a non-technical viewer without the requirement for special instructions.



WASHBURN RECEIVER, *fully aligned with one year parts and labor warranty*..... **$2995.00**

WASHBURN RECEIVER, *kit form, 90 day parts only warranty, less rotor motor* **$1495.00**

ramsey electronics **BOX 4072 ROCHESTER, NY 14610 (716) 271-6487**

only at home but worldwide, that they need to be concerned that by artificially restraining distribution of their hardware in the US private sector that **they** are creating a scenario which can only be solved by the entry of offshore producers.

NHK: What about the present firms supplying hardware to the private marketplace? Are any of them capable of handling the business that seems to have been generated by your Miami Seminar?

Coop: Not today. I firmly believe that there is a market right now, today, for no fewer than 1,000 private terminals per month in this country. And that overlooks the needs outside of the US, such as in Canada, the Caribbean and so on. If the commercial producers are capable of turning out 200 new terminals a month with an average of 5 receivers per terminal, the private sector manufacturers will do well to crank out 200 terminals more with 1 radio per terminal.

MOTHER: In other words it is a seller's market?

Coop: Yes, but that is not the total answer. It is still an engineer's market. By that I mean the suppliers in this field are, almost without exception, run by engineers. And engineers are people who are never happy with their present design; they are always thinking a generation or two ahead. We need some savvy marketing people to get into this market and freeze designs and start the production lines rolling. Instead, we have firms turning out 15 or 25 radios a month, changing the design and losing a month, and then turning out another month or two of production before they again change the design.

NHK: Isn't it important to keep on designing and re-designing a piece of hardware like a receiver to keep the latest technology in the current models?

Coop: It is my opinion that any radio that works would sell today as long as the price was between $1500 and $2500. I have great admiration for people like Clyde Washburn and Paul Shuch who are constantly making their designs better. But at some point in this development we need 500 radios per month popping off the production line. What product do you buy today that won't be better if you waited until next year to buy? It is ludicrous to believe that you can't tool up for volume production because you fear you will be outclassed by someone with later technology next month. If Henry Ford had adopted that attitude we'd all still be traveling by horse and buggy.

MOTHER: Isn't there a chicken and egg scenario here? We have a handful of small suppliers who probably got started with a few tens of thousands of dollars of invested capital plus thousands of donated hours of time. They have to crawl before they can walk. How can they jump from 25 units a month to 500 units per month?

Coop: By changing their underwear. They have been so concerned with not starving and staying alive that they have worn the same under garments from the day they first decided to get started in this field. Now they are swamped with orders and they see a light at the end of the tunnel. What they don't realize is that this is not a seller's market as long as there are unhappy buyers. Unhappy buyers are people who have the money to purchase 25 units per month and the inclination to do so; but when they go to buy their equipment they find that the best they can get is 5 systems a month. This is an intolerable situation that will last only so long. The longer this situation persists the sooner we'll see offshore imports in this country.

MOTHER: So you say they are in the convenient mold which they are reluctant to break?

Coop: Precisely. Each in his own way wants to increase production but each has some factor in his business operation or makeup which prevents him from really accepting the magnitude of the market and doing something about it.

NHK: Is there a solution to this?

Coop: I suspect there is; it is a classic problem of any rapidly growing industry. I think anyone sitting there as a manufacturer with orders for 3 or 6 or 10 times his present monthly production capabilities can find financing to increase his production capabilities. But he is going to have to give up some of his ownership rights in the process.

MOTHER: Which one suspects the present owner is unwilling to do?

Coop: Of course he is. He remembers the hard times, the hundreds or thousands of hours he donated to the project to get it off the ground, and he figures that anyone coming in now with pure cash is not entitled to any more than participation; certainly not control.

NHK: But you are suggesting that you don't think these present manufacturers really understand how tenuous their present position is?

Coop: I doubt most of them do. The reality of what will happen in this market if they don't start cranking out equipment in big volumes hasn't hit most of them yet. They are just starting to make money, just starting to repay the debt in money and time they built up in the formation of their businesses. They want to hold onto what they now have and hope they can survive when the shakeout comes.

MOTHER: A shakeout - you mean fewer firms producing hardware?

Coop: Ultimately, yes. But more likely there will be a period of acquisitions and mergers before that happens. Keep in mind that as long as we have this unresolved legal question of program rights access the big firms with lots of money to invest are going to stay out.

MOTHER: How long can the present industry simply ignore what you refer to as a murky legal picture?

Coop: No longer. I was very pleased to see a push from the attendees at the Miami Seminar to form an international trade association. I am happy to report that just such a group, known by the accronym SPACE which stands for 'Society (for) Private And Commercial Earth (terminals)' is now actively pursuing both memberships and doing extensive research on the legal battles to come. I have been preaching that this young industry cannot sit back and wait for the first full blown legal attack; it needs to create a strong offense going in. There's an old saying that the best defense is a strong offense.

NHK: What part are you personally, or Susan, playing in SPACE?

Coop: I am an unpaid and untitled advisor. They call me up to discuss their problems and solutions. They can take my advice or dis-regard it; I am not offended either way. I have offered a page in **CSD** to them to report on their activities and I believe that by May or June they will be using that space for that purpose. I have also donated a booth space to them for the California SPTS this summer where they will be actively soliciting memberships.

NHK: If you had a million dollars given to you tax free today with the only string attached being that you must spend it in a way that would enhance the growth and foundation of the low cost satellite hardware field, how would you spend that money?

Coop: That's an easy one. First I would see that the new SPACE group had the very best legal and research people it needed . We have got to address this murky legal question and the sooner it gets done the sooner we will have a completely clear title to the land many claim we are now poaching on. Then

MAKE INTELLIGENT PROGRAMMING DECISIONS...

...with **SAT-Guide**

Twenty channels of programming today on FI, soon 35 on FI and D2. Keeping up with what is 'up', when, is almost impossible. Until SAT-Guide.

ALL FI programs on **all** transponders are listed in this unique programming guide to satellites. INCLUDES daily program listings PLUS monthly summaries of movies, sports and specials. Only $28 per year from:

SAT-Guide P. O. Box 1569
Division of Commtek Hailey, ID 83333

with whatever was left I would establish a non-profit foundation that would engage the services of a small but very talented group of engineers and technicians whom I would personally direct to develop truly low cost hardware and systems. Whatever this research foundation developed would be available by license to any qualified manufacturer in the world. From these licensing fees the initial seed money in the foundation would be turned over so that the foundation could continue to develop hardware innovations for as long as such an effort was needed.

MOTHER: Wouldn't that be in conflict with private industry doing the same kind of developmental work.

Coop: Not at all. Private industry develops only products which suit the needs of that particular coporate philosophy. A foundation such as I envision would look at the **total needs** of the satellite communications field and it would draw upon the very private individuals such as Howard, Coleman, Washburn, Shuch and England's Steve Birkill who have gotten us where we are today. A foundation like this would recognize that purely private people such as these can make outstanding contributions to technology even when each such person is working on their own with nothing driving them to succeed but the challenge of accomplishment. The motivation for Steve Birkill, for example, is purely the challenge; he is not operating under any corporate guidelines nor under corporate goals. This is a very important element of our technology and it needs to be encouraged and more important it needs to be coordinated. They say that space is the final frontier. It may not be the last one but for right now it is the big one. I happen to believe that individuals with a talent can make very important contributions to where all of this is headed. It's that same spirit that used to dominate the amateur radio field years ago; it is still alive and well on dozens if not hundreds of garage workshop benches all over the world. People working on their own like this don't know the meaning of the phrase "You **can't** do that...". I would like to have some sound way to encourage this continued individual work and then to insure that when such work pays off the developer gets a fair shake from industry for the rights to his idea. Each such success will generate dozens of additional individual efforts. That's the most important factor in the development of this field to date. Individual effort that is ultimately shared with everyone.

MOTHER: Has anyone offered to fund such an effort?

Coop: No, I've never even discussed it publicly before. It is simply my concept of how something that started as a grass-roots American technology can continue along in that same vein. I believe American ingenuity, although I wouldn't limit it to American participation, is still alive and well and the foundation I envision would create a privately endowed vehicle to insure that as this whole telecommunications revolution sweeps the world American know-how stays out in front of the other national interests.

PROGRAMMING CORRESPONDENCE

SPTS '80/MIAMI

Perhaps if you are giving this a 'title' you should call it "Don't talk when you should be listening...**or you may get put to work!**". My brother Charles and I arrived at Miami the day before the event began and we were looking over the antennas being set up and visiting with others doing the same thing. One of the SPTS attendees we ran into was David Weeks of Delray Beach (FL). Since Dave Weeks' occupation is similar to mine (each of us own and operate a couple of small CATV systems) and since his interests in TVRO work was also similar to mine, and, since, we were both interested in flying and scuba diving we naturally had a lot to talk about. Especially since we had brought complete scuba gear to Florida with us and Dave Weeks knew all of the best places to go. What we didn't realize at the time was that contrary to popular misconception, Florida is (or at least can be) **cold** in February. Nevertheless Dave told us all about the best places to dive and what to look for and even offered to take us out in his boat if we could stay through the weekend.

In retaliation I tried to explain to him how to build a TVRO antenna like mine; it is a very simple antenna but the simplicity of the antenna seems to be the very thing that makes it difficult to understand without a detailed set of plans. We saw Dave the next day (Tuesday) after spending the night in a hotel. I wouldn't want to say the hotel was raunchy or ratty or dirty...so I won't say anything about it. However after one night of staying there we decided to sleep in our van the rest of the time! Dave, it seemed, had a couple of empty bedrooms at his place in Delray Beach and he had decided to try to build my antenna but he needed a bit more help. The end result was we spent the next 3 nights at his place and built him a TVRO antenna.

Meanwhile, back at Miami, I met up with Joni and David Brough (we had gotten acquainted at the first SPTS in Oklahoma City). He found out what we were planning on Wednesday night so the Broughs and Mrs. Oliver Swan came up to Delray Beach to see what we were doing.

I was very impressed with Mrs. Swan; she seems to be such a nice, decent lady. I told her about meeting Oliver last August and how he had influenced me and made me realize that building an antenna wasn't too complicated if you just go ahead and do it. It seemed to please her that we were using Oliver's design and putting it to practical use.

Wednesday we had only the lattice material. We used 1 x 2 (really 3/4 x 1-1/2) redwood strips. So Thursday after SPTS concluded we (my brother, Dave Weeks, his dad, a friend of Daves named John Williams and the Broughs, with me of course) gathered up the frame material (we used 2 x 2 aluminum angle to prevent rust problems) and assembled the antenna. We got started late but stopped around 10:30 that night with the antenna ready for the window screen. At that point it would take two people about a half day to complete the assembly, set it up and adjust.

So sometimes it seems the side effects of SPTS are nearly as great as the main event. Keep up the good work.

H. D. McCullough
Salem, Arkansas 72576

Indeed! We were delighted that Veleda Swan was able to join us in Miami for a portion of the seminar and we knew she had been escorted by Dave and Joni 'up the coast' one evening; but had no idea what was up. McCullough apparently has the Swan TVRO Antenna duplication 'tricks' down pat; see separate report in our Technical Section this month.

IN THE CAN

Over a year ago I ordered one of your manuals and have worked it into a purchase proposal for an earth station here at the Arizona State Prison Complex. Now we have the money set aside for the system but have run into a problem; deciding which of two suppliers to choose from. I would like to give you a rundown of the equipment being proposed and ask your advice on which equipment we should buy. Comtech of Tempe, Arizona are offering us their own receiver, their own antenna and a LNA from Amplica. This would be a five meter dish with a prime focus. Gardiner Communications of Houston, TX

suggests we purchase their 4.6 meter dish with a Cassegrain feed system, their SCI LNA and the SCI receiver. Can you help us decide?

Paul D. H. LaBarre
ASPC-TV
Box B #34860
Florence, AZ 85232

Both Comtech (which has **not** been active in the private TVRO field) **and Gardiner manufacture good gear. The differences between the two systems on paper are all but not measureable. Which brings us down to price; if one is appreciably lower in bid to you than the other, buy that one. If the two are comparable in price, look at the delivery schedule** (we assume you are in a hurry to get it!). **Finally if everything else looks comparable between the two, look at the proximity of each; Tempe is closer than Houston and if there are problems in theory you would get faster service from Tempe. All that aside, we are intrigued by what may be the first** in-prison TVRO system **and salute you for pulling it off. However, we would not want to be responsible for deciding which transponder that receiver is tuned to; some of those viewers could get flat mean!**

BIG RESPONSE

Thank you for mentioning our company in Coop's articles appearing in **Popular Science** and **Radio Electronics**. The response has been overwhelming!!! We are averaging over thirty pieces of mail per day from all over the world; including South America, Mexico, Alaska, Caribbean and so on. We desperately need up to date footprint maps for these outside of US areas so we can properly repond to these people who seem desperate for television. Can CSD help?

Bob C. Mooney
Satellite Television Systems
Reno, NV 89510

We too have had a big response from the current series of Coop articles running; especially Popular Science. The latest footprint maps are the old footprint maps; i.e. as shown on the rear of the Satellite Wallchart. Basically, as was discussed in great depth at SPTS '80 Miami in several sessions EIRP's in areas such as the Caribbean and northern South America are in the 28 dBw and below [way below like 18 on the extremes] regions. In fact the INTELSAT BrazilSat hemispheric beam is hotter [27 dBw] than the US domestics in much of this area. The truth is domestic satellite footprint maps outside of the continental US are at best guesses by the fellow who prepared them. The first terminal in each area will have to pioneer...and risk some money that there is in fact usable signal available there.

REMEMBERS OLIVER

Your very nice tribute to Oliver Swan will surely inspire other cable technicians and managers to better serve the people who want better television through cable. That the smallest of cable systems can lead the rest of us in techniques and technology shows how very young our industry still is.

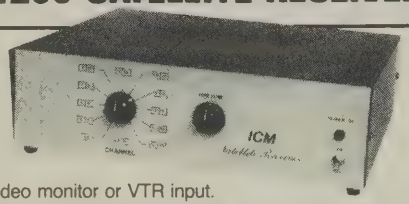
Peter Kendrick
Home Theater Network
Portland, Maine 04101

Oliver Swan passed away late this past December but the pioneering work he began will be with us for decades to come.

PREMIUM BACK ISSUES

I enjoy **CSD** and the informative technical and programming articles. I hope to have a system in operation by the end of this year more or less following the Coleman and Howard manuals plus the updates in **CSD**. However I am missing the October issue of the Digest and while I understand no more copies are available from you I wonder if one of your readers who is finished with his copy would be willing to sell it? I would hope that it would be in good shape, complete with both the Technical and Programming sections along with the cover.

NEW ICM TV-4200 SATELLITE RECEIVER



Provides You With These Features For $1,995

- Output levels compatible with video monitor or VTR input.
- Dual Audio Outputs 6.2 and 6.8 MHz. • Built in LNA power supply
- Tunable Satellite channels 3.7-4.2 GHz.

International Crystal Mfg. Co., Inc.
10 N. Lee Oklahoma City, Ok. 73102 405/236-3741

The closer it is to a new condition, minus tears, stains and doodles the more I would be willing to pay. Also I would like to ask that **CSD** run some articles on antenna mounts, antenna positioning controls and the techniques utilized to measure signals.

Reginald M. Wagner
10916-153 Street
Edmonton, Alberta T5P 2E2
Canada

We hope you find an October issue but doubt it; CSD **back issues have appreciated in value several times faster than the run-away inflation rate! Susan [Cooper] has carefully stuck a dozen or so copies away in a safe place for each issue and she says she is going to send the kids through college by selling them off someday! Antenna mounts - we'd like to have some field data to turn into articles. Field strength measurements - utilizing the TVRO receiver, coming up in May.**

DEED RESTRICTIONS

I would like to know if anyone has successfully installed an antenna in an out-house. I have run into a problem with deed restrictions on antenna in our sub-division. Are there other alternatives to 'hiding' a ten foot dish antenna?

Don H. Morrison
681 Lockmore Ct.
Rochester, MI 48063

There are some possible solutions. Depending upon one's look angle to the bird[s] you can submerge the dish below ground line (partially or completely) **in a hole. Calculate your look angle to FI and then take some scaled graph paper and determine how far below ground you can drop the base of the parabolic surface and still achieve the desired look angle clearance on the side of the hole. You may get as much as several feet of reduction in antenna height that way and as Dan Yost of COMPUCON would point out getting the antenna down in the ground will reduce the susceptibility to terrestrial interference** (the ground is a great blockage to 4 GHz telco circuit signals). **Others have placed a geodesic dome over their antennas** (plastic or fiberglass covered) **under the guise of creating a small 'green house'** (see gardening publications for advertisements for $100 to $500 domes like this). **Deed restrictions against antennas are a problem; several Canadian CATV firms in the Toronto area recently tried to stop installations of Canadian private terminals by bringing the deed restrictions and zoning restrictions on the books to the attention of the authorities; hoping that they would shut off private terminal growth in Canada in this way. Our suggestion is simpler than any of this. We suggest you not call the dish an 'antenna'. It is simply a 'solar collector'. Are you not interested in experimenting with solar heating and is that 10 foot dish not truly an experimental solar heating system? In other words,** call it something else; **something not covered by zoning or deed restrictions. As noted in the March** CSD **[see Programming Section Jim Vines of Paraframe imported a**

parabolic into Canada by calling it a solar collector; if it worked for Jim it can work for you!

SOMETHING HAPPENING HERE?

I have read Bob Cooper's article in the January 1980 edition of IEE News with regard to small satellite television receiving systems. Our firm, Electrical Equipment Limited, is a major electrical company in Australia. At the present time the Australian Government is looking into the establishment of a domestic satellite television (and narrow band communications) satellite and once that is in place the market for home receivers could well develop in a way similar to the United States. What are your thoughts as to the development of the Australian market?

P. T. Nicholson
Electrical Equipment Ltd.
Sydney, N.S.W., Australia

The Australian domestic satellite system, when operational in the mid 80's [at the earliest] will be in the 12 GHz band. Details of the system are still being worked out in preliminary planning but it appears that 2-3 foot receive antennas plus 4.5 dB [or better perhaps by the mid 1980's] noise figure front ends will produce high quality video with receive terminals which may be priced to the end user in the $700 to $1,000 [American] region by that time. We understand there is the possibility that as an interim measure Australia may lease a transponder from INTELSAT using the present 4 GHz service band. Based upon our SPTS '80/Miami testing, if INTELSAT provided a hemispheric beam to Australia for this service reasonably good quality television (8 dB CNR) **could be provided to 4.5 to 6 meter terminals with 120 K LNAs. One advantage to this interim service would be that by using a hemispheric beam the coverage would extend from approximately the International Dateline - west, north and south of the equator, providing first-time television to a substantial number of islands [and countries] now without any television. We hope it happens.**

THE TIDE CHANGES

I wanted to thank you for inviting me to participate in SPTS '80/Miami. The seminar was well organized and the participants seemed enthusiastic about the legitimate opportunities small aperture terminals and other associated delivery systems present. There were many interesting and probative questions asked and the next months and years will tell a great deal about the future of this new industry, and how regulations may develop around it.

John D. Pellegrin
1101 Seventeenth Street NW
Suite 904
Washington, D.C. 20036

John Pellegrin was one of two Washington communication attorneys on the program in Miami. His advice on the legal aspects of private TVRO reception plus his crystal ball gazing into the future of this area was much appreciated.

NO TV IN GUYANA

I read Bob Cooper's article in the IEE News of January 1980 and I am very much interested in having access to this new technology. Guyana has no television system and I have been attempting to gather information that would allow me to have this service here. We recently updated our INTELSAT terminal to 'Standard B' and the introduction of this system prompted my interest in private satellite TV reception. Can you help me in getting started?

Michael Welch
Guyana Telecommunications Corp.
Georgetown, Guyana

There are several countries along the northern edge of South America still without domestic (terrestrial) **TV service. The choices for reception are numerous; based upon the SPTS '80/Miami tests of INTELSAT with the Paraframe 5 meter antenna we now know that reception from BrazilSat is possible. Additionally, with the announcement that COMSTAR D-2** (parked at 95 degrees west) **will be placed into service this month for up to 11 additional channels of cable programming we have to observe that at least one set of six transponders** (out of the 24 on board) **bore-sight on Puerto Rico and the spillover from this shows** (according to FCC map data) **30/31 dBw footprint over Georgetown; not too shabby!**

A RECEIVER LICENSE TAX?

The concept that the reception of electromagnetic radiation is not an inherent right but rather one legislated by a Congress or agency (FCC) is quite common here in Europe. Many countries charge for a radio of television receiving license, which on the surface sounds like a tax on the equipment, but it is collected yearly like an operating tax. I believe that if the authorities in such countries were to locate a home built set that too would be taxed in a similar fashion. As an American stationed in Norway, I have that American belief that it is my 'right' to pluck anything out of the air that is radiated in my direction (and if they don't want me to try to demodulate what they **beam at me** then they can point their antenna in some other direction). I have considered the possibility of constructing a satellite receiving station here in Norway but would primarily be interested in English speaking programming. I don't know how much English is beamed via INTELSAT but rather doubt I am in a location where the U.S. DOMSATs could be received. However, if I did choose to put in such a system I too might have to fight as they tell me here such a station would be illegal also.

Richard D. Dunham (LAØCD)
Rege, Norway

Dunham's observations point up the importance of having a legal system such as we do have here in the United States; one that in this instance recognizes that reception is not regulated directly (i.e. through receiver-use taxation and licensing).

NFL IN SINGAPORE?

For about a year I have been trying to find out the location and programming possibilities for direct satellite reception here in Singapore. I have been told that the American Forces stationed at Clarke AFB in the Philippines receive the NFL games 'off the bird'. I later was told the signals are received in Manilla and fed by terrestrial microwave to Clarke.

We do have a few 'hard-core' sport fans here in Singapore who would hardly mind drinking beer at 3 AM some morning and catching the live football action from the states. Can you direct us in the right direction?

James L. Gauntt II (9V1SI)
Singapore

Here's a guess. One of the morale boosters the Armed Services have been trying is to upgrade the (home originated) **TV service at bases around the world. For years videotapes have been made by AFRTS and shipped into bases like Clarke where they are distributed either via base-located CATV systems or on occasion via a low power** (typically under 100 watt) **VHF channel transmitter. RCA is currently funded on a contract to find ways to feed live events** (such as NFL games) **into these spots since the Americans there are pleased but hardly overwhelmed by seeing TV shows that are a month or more old. As an interim measure we would not be surprised to learn that AFRTS was on occasion leasing INTELSAT transponder space to send selected events into areas such as Clarke. If this assumption** (and we label it as such) **is true that means that a suitably equipped private terminal could 'dial in' the same feeds. Perhaps a reader has more precise information?**

THE FOUNDER

As an incorporator of COMSAT (and virtually the only one who knew how a satellite system would work) I am delighted to

see the technically and economically feasible finally happening. Please send me your Satellite Study Package as described in the February issue of **RADIO ELECTRONICS**. Now, what is your forecast for scrambling?

B. Graham
Yucca Valley, CA 92284

It is amazing how many people who were influential with the founding days of COMSAT/INTELSAT have shown up recently. Several of Graham's early cohorts were seen at SPTS in Miami musing about how far and fast all of the satellite technology has changed in just a few short years. We keep saying that as more and more creative people get involved in this technology explosion nothing will be impossible long. Scrambling? That's another possible impossible!

FI + D2
MORE PROGRAMS OR
MORE PROBLEMS?

THE CABLE NET II MYSTERY

As **CSD** reported in some depth in the February 1980 issue (see page P2) the loss of RCA's FIII spacecraft during the apogee kick motor firing in December has sent shivers through the entire cable industry. Most impacted were those new programmers who had intended to be on satellite by this time, through a re-shuffling of the FI and FIII transponders in an ultimate sequence only known to RCA.

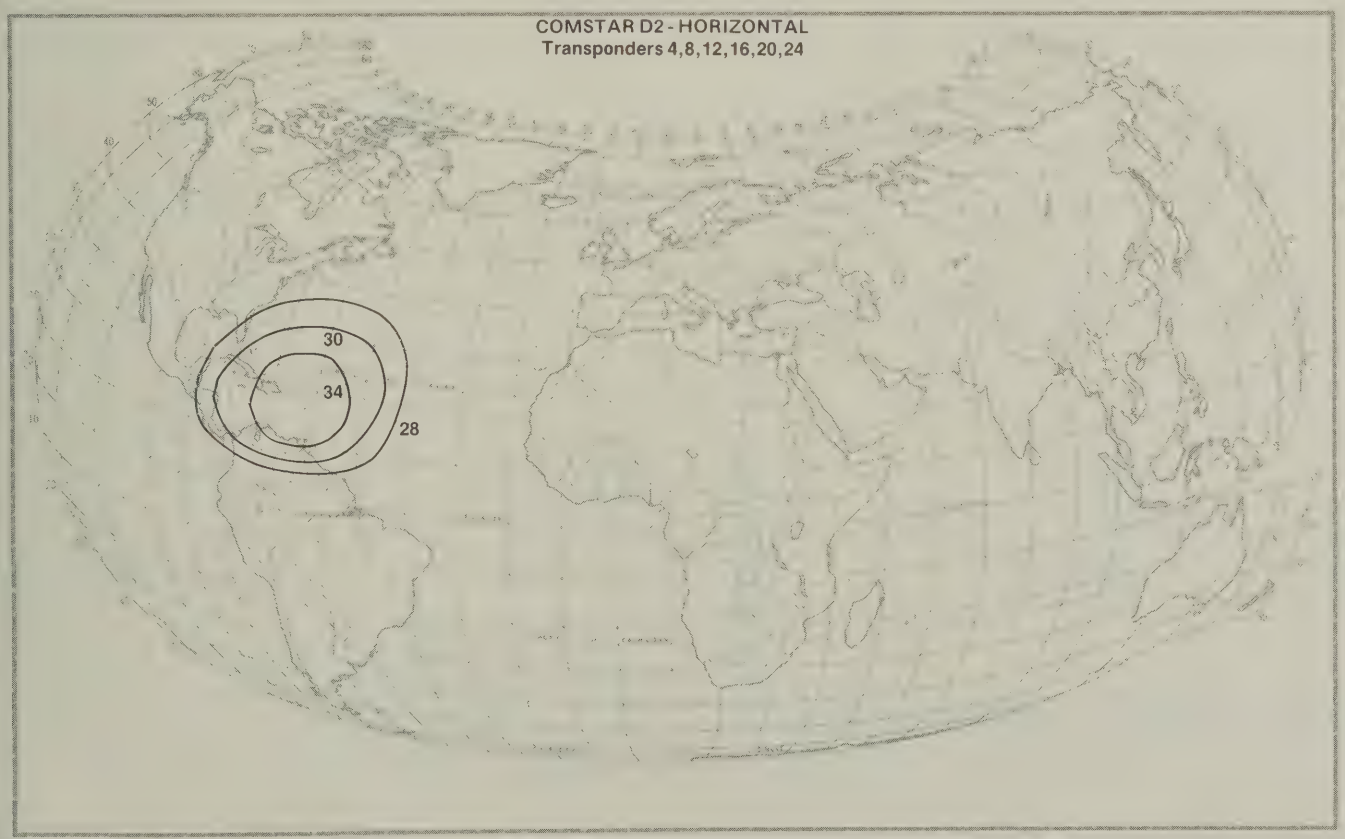
With the loss of FIII RCA was faced with a series of problems. They had (they reported) 11 additional cable programmers standing in line ready to launch their own programming on satellite, but with FIII lost, no place to put them. When the February **CSD** report was prepared the best bets suggested that RCA's FII spacecraft, located at 119 degrees west, would play a major role in the re-configured cable services. RCA, on their own apparently, had decided to call the second level of cable programmers "Cable Net II"; to differentiate these new programmers from the established services currently on FI.

It was anticipated that RCA would do two things to get these 11 programmers operational:

1) **Move two data channels** now in operation on FI (transponders 15 and 19) off of FI to some other bird; thereby opening up two additional transponders for cable video services.
2) **And**, shift some of the FII transponder loading around off of RCA birds to perhaps other birds, thereby clearing FII for up to 11 channels of cable video.

Alas, for reasons again best known to RCA the decision has been made not to do either of these things. RCA said they could not clear transponders 15 and 19 on FI "for security reasons". And FII? "Simply not suitable...".

The alternative? RCA would ask ATT/GT&E to release "up to 11 transponders on COMSTAR D-2 (located at 95 degrees west) for Cable Net II". Now the ATT COMSTAR birds (which they lease from COMSAT) have at best been under utilized. Rehashing the speculation as to why ATT has



three separate 24 transponder birds in orbit but perhaps no more than the equivalent of 6 full transponders of traffic going through these birds is a waste of time. The facts, as released piece by piece to the FCC in January are clear enough; ATT simply is under utilizing their satellites. Additionally, there are apparently some serious problems with the satellites technically (although only ATT knows for sure). Furthermore ATT would like to launch a fourth COMSTAR; they would have liked to nail down a fourth in-orbit position with IV but now they may have to settle for merely replacing one of the exising birds with IV (probably D-1 at 128 degrees west).

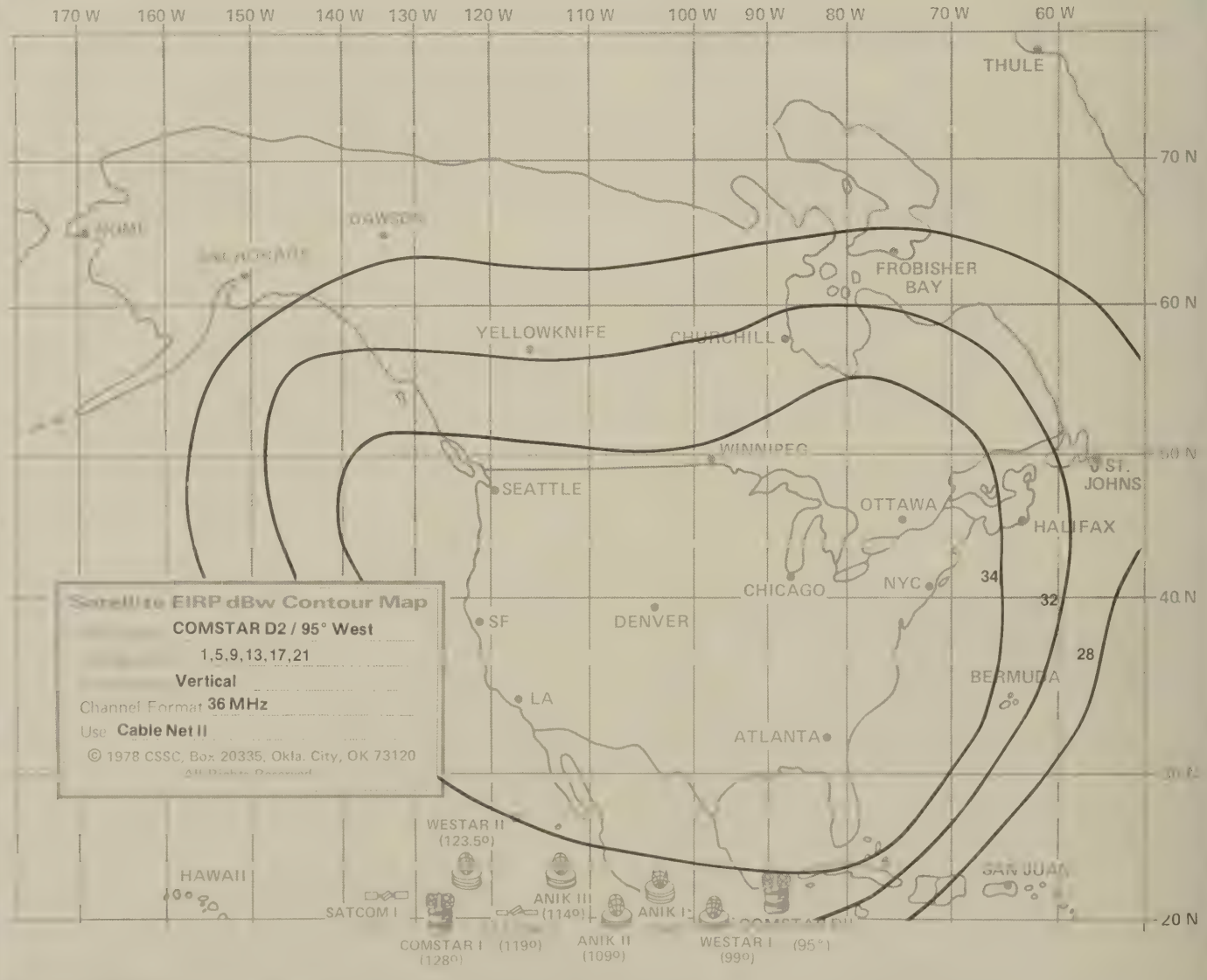
RCA asked ATT to sub-let to them 11 transponders which RCA would then re-sub-let to the cable industry. ATT could hardly say no; they had just admitted to the FCC that their satellites were at best lightly loaded with traffic.

But which D series bird would it be? D-1 at 128 degrees is (even ATT admits) suffering from serious powering and transponder problems. D-3 is the newest, located at 87 degrees, and nobody likes to give the keys to a brand new car to a competitor. That kind of suggested D-2 at 95 degrees.

However as our December 1979 **CSD** report detailed, COMSTAR birds have a unique approach to boresighting of their downlink transmit antennas. All D series birds are 24 channel; which means that like the RCA SATCOM birds 12 channels are linear vertical and 12 channels are linear horizontal. And, like the RCA birds, each bird has four downlink (or transmit) antennas with six of the transponders connected to each transmit antenna. Now the rub.

ATT, by design, has directed the boresight of each of the four transmit (downlink) antennas in a different direction. For example, as the on-file-at-the-FCC data shows, the present boresight configurations for D-2 are:

1) **Antenna group one** - boresighted on central USA (34 dBw line extends outside of US proper - **see map here**) for transponders 1,5,9,13,17 and 21 (vertical).
2) **Antenna group two** - boresighted on what would be Alaska...but unfortunately Alaska cannot be 'seen' from 95 degrees west so this pattern actually ends up in space (per the FCC on-file EIRP or footprint data). This entails transponders 3,7,11,15,19 and 23.
3) **Antenna group three** - boresighted on Hawaii with transponders 2,6,10,14,18 and 22. The EIRP is 34 dBw which is good news for Hawaii **if** the pattern is left alone (the present FI levels in Hawaii are in the 28-29 dBw region).
4) **Antenna group four** - boresighted on the Caribbean (San Juan) with a 34 dBw contour extending over everything from the Isthmus (i.e. Panama) on east to the far eastern Caribbean (**see map here**); horizontal on transponders 4,8,12,16,20 and 24.



This suggests that there are only six transponders (vertical set 1,5,9,13,17 and 21) which service the continental United States (or called CONUS). That sounds like bad news. However there is more to the mystery.

The Hughes built bird transmit antennas are deployed in their fixed positions at launch. There are two reflectors and four feeds. One **reflector** is positioned so that with the appropriate feed it can send boresighted signals to Alaska, Hawaii or CONUS while the second reflector is set up with its feeds so it can boresight on CONUS or Puerto Rico. And the feeds can be switched, by ground command. For example:

1)**The Alaskan beam** (which is really a 'space beam' since the bird cannot 'see' Alaska) can be brought back to boresight on CONUS proper, or into a half-way mode step where the boresight is sort of half way between Alaska and the U.S. That says that under this switched configuration transponders 1,3,5,7,9,11,13,15,17,19,21 and 23 (or **all** of the vertical channels) **could** in fact service CONUS (but not Alaska; the Alaskan's are simply not going to get service from D-2 unless they live in the far south of the state).

2)**The Puerto Rico** beam can be switched back to the mainland boresight as well, but in so doing they lose Caribbean coverage.

3)**The Hawaii beam** can also be switched back to CONUS but of course Hawaii is lost in the process.

Note that the horizontal transponders (2,4,6,8,10,12,14, 16,18,20,22 and 24) are either/or situations; either Hawaii **or** CONUS, or, Puerto Rico **or** CONUS.

Now, which of the 24 transponders on board are likely to be utilized for the 11 new Cable Net II services? One source reports ATT is offering to 'clear' 7 vertical and 4 horizontal transponders. Clearing 7 verticals seems quite simple; six are pre-designed for CONUS boresight and the other six are switchable back from the non-boresight of Alaska to CONUS. Which 7 will remain a guessing game until RCA and ATT and the would-be cable programmers who may or may not wish to be on D-2 all get together. The horizontal group of 4 forecast for cable is another mystery. Obviously someone (either Hawaii or Puerto Rico) is going to lose service in the process since when the boresight is switched back to CONUS the on-file boresight coverage goes away. The best speculation we have is that Hawaii will lose service and that says the 4 transponders ATT has offered for CONUS coverage on horizontal will be in the 2,6,10,14,18 and 22 group.

If this presumption is correct, what does that say about the liklihood that Caribbean area terminals will have decent quality video on relatively speaking small terminals from D-2? One Hughes source suggested to **CSD** that "there may be some surprises here", meaning that while **on paper** the boresights after switching will **not** help the central or southern Caribbean, that in the real world there may be some positive side effects. The same source suggested levels may be as much as 3 dB higher in the real world than on paper on the after-switched beams in the Caribbean. We'll see.

There was speculation that video would end up on the Caribbean beam and it would remain boresighted in the Caribbean. Let's squelch that one right now; if this happens, it will not be cable television video. Cable interest is with CONUS, not the Caribbean.

(Incidentally, D-1 and D-3 also share this switchable boresight capability. This may help explain why published EIRP maps for the COMSTAR birds do not correspond with observations; the published maps only reflect **independent** deployment of four separate boresights whereas in the real operational world the boresights may be all concentrated on CONUS as outlined here.)

Politics

Into this technical mish-mosh enters the real world of the needs of the cable programmers who saw their programs disappear in a poof of smoke last December when FIII went away. They have a number of bottom-line (i.e. financial) concerns including:

1)Unless there are several 'strong' programmers on D-2, the cable industry will not spend the money for a second TVRO antenna, LNA system (two LNAs since both polarizations are forecast for use), an ortho coupler (for separating vertical and horizontal signals into two separate downlines) and the usual bank of receivers (one per program channel to be carried).

2)If the programming sources on D-2 are 'weak' (i.e. largely appeal to 'minority interests') then D-2 programmers will flop; not enough cable systems are going to spend upwards of $15,000 per terminal (plus $2-3,000 per receiver).

Clearly what is needed on D-2 is some service that the majority of the cable systems are willing to spend money to receive. RCA knows this very well. That's why RCA has always been very careful about making its own transponder assignments and attempting to arrange the programming sources so that 'some biggie' is on each service offering. (The cable industry started off with all programming on **horizontal only** and when the number of services grew to the point where expansion to vertial was required there was considerable speculation that cable systems would not invest in an ortho-coupler [$500 range] and a second LNA.)

It is in RCA's interests that Cable Net II have at least one 'biggie' on it. Something like HBO or WTBS. Unfortunately, the established biggies are not about to move. So one suspects that RCA looked at the additional 11 users to decide which one looked like a winner. Ted Turner's new Cable News Network fit the bill.

Turner, however, claims he was guaranteed, in a 1976 contract, access to the major cable bird. RCA and Turner are headed for court. Turner wants on SATCOM FI for his June start date of CNN in the worst way; simply because by being on the bird that all cable systems already have a TVRO antenna for, he is guaranteed the largest possible audience for CNN in the shortest possible time. RCA, **one suspects**, wants CNN on Cable Net II for the same reason; he will be attractive enough with CNN to drag cable firms into the second antenna business and with terminals in place for one D-2 transponder the rest of the programmers on D-2 will then have a fighting chance at getting their programming carried by a large number of cable systems.

The cable industry's reaction to the D-2 plan was explosive; only one supplier immediately indicated he **would** take a slot on D-2; the others were mum, or plainly angry. COMSTAR birds are not well known in the cable industry; what is known is not liked.

So we have a very confusing picture, both technically and politically. Clearly there are more would-be cable programmers chomping at the bit to get on satellite. RCA had it all wrapped up in a package the cable industry was ready to swallow until FIII was lost. Now it is a whole new ballgame. Some of the programmers might start programming on D-2 as early as this month (April). **Or they might not start at all.** Stay tuned!

BIRD OPERATIONAL NOTES

SERVICE to Virgin Islands (US) via SATCOM FI for WTBS has been approved by FCC. All US domestic satellites

must go through location by location approval procedure for any receiving sites **outside of** US proper. Puerto Rico had been previously approved.

VCI SATELLITE which had been scheduled to begin feeding up to 12 hours per day of movies for 'off-shore oil rigs' and other 'remote sites' via WESTAR III back on January 1 now says they plan to start in June. **Newest twist** - they will multiplex two video signals onto single transponder (plus have four audio subcarriers) in move they characterize as 'insuring that only paid subscribers will receive signal'. Whether service will utilize split transponder (i.e. a pair of 17.5 MHz channels within a single transponder) or interlaced field system (i.e. alternate lines for each video signal) is unclear although latter approach typically requires $20,000 'decoder' at **each** receive site.

COMSAT plan to create with Sears direct to home pay satellite system seems to be 'delayed' at FCC; plan to hit FCC with full blown details in March didn't come off.

MICROWAVE ASSOCIATES (M/A-Com) may be next 'major supplier' to jump into the low-cost (as in private) home terminal market. Noises about "$6,000 compete home terminals" have surfaced of late with some in firm speculating such terminals will be available by end of this year. Primary interest here is the firm's $150 million dollar range annual sales in microwave hardware and components and their demonstrated ability to deliver reasonably large quantities of hardware.

RCA has dedicated a new uplink site in Los Angeles area for feeding of video and audio programming into satellites that will ultimately carry programming to US bases and other locations outside of USA (AFRTS).

HBO's transponder 20 on SATCOM FI carried extensive video and audio on recently completed Lake Placid Olympic games to west coast where COMSAT earth station beamed them on to INTELSAT FIV-A (8) located at 174 degrees east for delivery to NHK Tokyo. Viewers who stumbled across feed were probably unnerved by Japanese language audio on some transmissions!

SPTS '80/Miami delegate who left west coast carrying proto-type Tay Howard receiver (see page T3 of March **CSD**), 10 foot 'expanded' Chaparral dish and 120 degree LNA to 'test' reception possibilities at various Pacific island sites hit paydirt at one stop. Terminal set up in Marshall Islands produced good quality pictures from INTELSAT transponder 12 (174 degrees east; virtually overhead) operating on 1/2 transponder format. Later stop at Nauru produced less satisfactory results but reception was possible even there. Next step will be improved system and better defining of INTELSAT footprints available throughout Pacific area west to Australia.

A motel in Virginia Beach, Virginia (Princess Anne Inn) is receiving plenty of publicity in trade publications because of its earth terminal. Motel operator claims he is able to maintain full or near full status during normally quiet weekends in winter because he offers HBO, SHOWTIME, Movie Channel, and other selected satellite fed events. Innkeeper Scott Sterling reports his fame has spread to point he now spends large portion of day answering telephone and letter inquiries from other motel operators throughout North America.

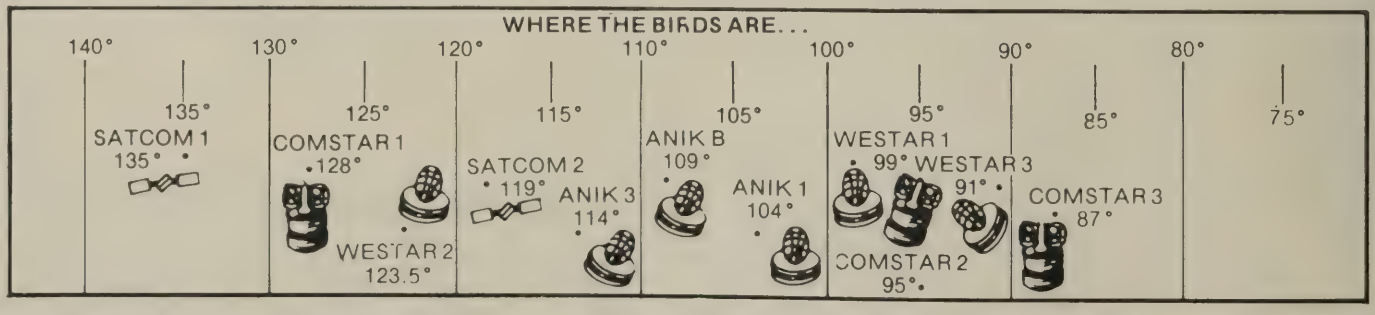
APPARENTLY first operational UHF TV translator fed direclty by satellite went into operation in Denver recently; carrying Spanish International Network (SIN) feed from WESTAR II. They are calling system (which has 5 meter dish) a 'Satellator Station'.

UNITED NATIONS starting to focus on 'questions presented' by direct to home broadcasting. Two issues seem at stake at this point: (1)determining who owns air rights over equator (some nations in South America claim their 'rights' extend straight up forever), and, (2)deciding how one nation's domestic broadcasts will be kept out of adjacent nations. Soviets and a few others are demanding that agreements to be worked out prohibit one nation from allowing its signals to be picked up in other nations. Interesting position for Russians who utilize inclined Molniya orbit apogee over top of Canada to spit television back over the top of North Pole into Orbita receiving terminals; (**CSD**, 2/80) when said transmissions are clearly receivable over most of US and Canada!

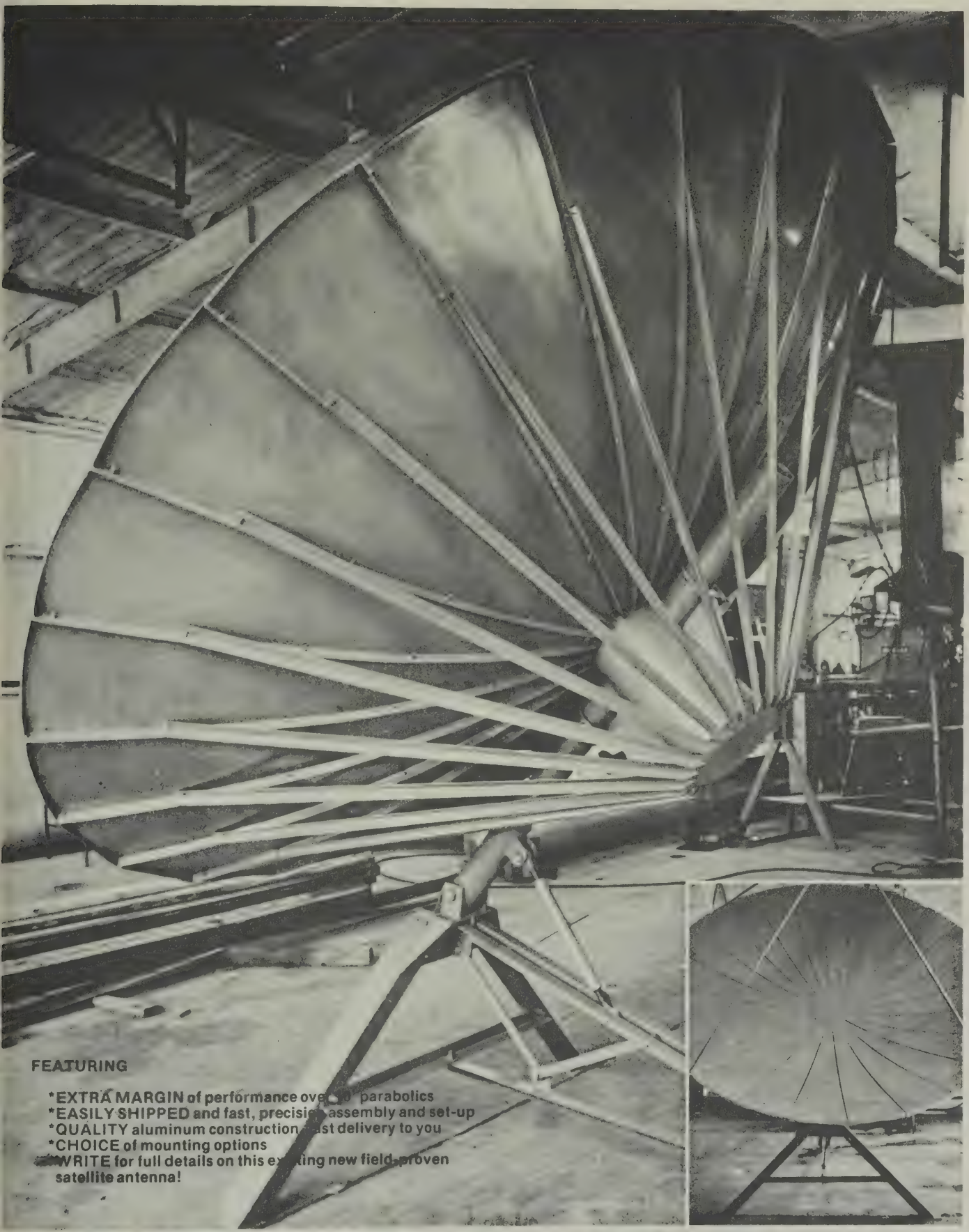
BY JUNE it is expected that first regular uplinks from Washington, D.C. will be in operation. System will use C-SPAN site and parts of terminal and allow broadcast stations and others to start taking direct news feeds from DC correspondents, others, for local airplay.

MEXICO has started expanded use of WESTAR II; SIN now carries around 12 hours per day for US affiliated stations. **New use** is for movies, sports, novellas and other network programming for Mexico City's XEW. Apparently Mexican TV stations are now getting some direct feeds via WESTAR II. Bottom line is that WESTAR II has a **pair** of Spanish language program channels now operational.

Quick-Satellite-Facts: Audio subcarriers currently in use on SATCOM FI are as follows. Transponder **3** - WFMT (stereo clasical music) is on 5.8 MHz. Transponder **6** - UPI News and Slow Scan is on 6.2 MHz while Easy Listening Music is on 7.4 MHz. Transponder **21** - The Disco Network is on 5.8 MHz while Seeburg Background Music is on 7.4 MHz. **Program control tones** are as follows: Transponder **5** (Movie Channel) turns on east/central receivers with 311 * # and west with 519 * #. Transponder **9** (Madison Square Garden Sports) turns on with 438 * #; Calliope turns on with 168 * #; C-SPAN turns on with 195 * #; and, BET (Black Entertainment Television) turns on with 018 * #. Transponder **10** (Showtime) turns on with 576 * #. Transponder **11** (Nickelodeon) turns on with 749 * #. Tranponder **12** (Showtime) turns on with 576 * #. The Mini-Pay service (Front Row) on transponders 10 and 12 turns on with 481 * #. On transponder **21** SPN utilizes 429 * # while HTN (Home Theater Network, 8-10 PM eastern) utilizes 207 * #. On transponder **22** Modern Satellite Network utilizes 421 * # while HBO (west) utilizes 835 *#. On transponder **23** (HBO's Take-2), they use 529 * # for the eastern two time zones and 681 * # for the western two times zones. Transponder **24** (HBO east) utilizes 835 * #. RCA owned and operated uplinks include Atlanta (not supposed to have video although it has been seen). Vernon Valley (N.J.), Chicago (Lake Geneva), Los Angeles (South Mountain), San Francisco (Point Arena), and Houston. Western Union owned and operated uplinks include Glenwood (N.J.), Chicago (Lake Geneva), Los Angeles, San Francisco, Dallas, Seattle, Phoenix, Atlanta and Honolulu. ATT-GTE uplinks include New York City, Chicago, Tampa, Atlanta, Honolulu, San Francisco and Los Angeles. PBS uplinks include Washington, D.C., Denver, Columbia (S.C.), Lincoln (NB), Hartford (CT) and Talahassee (FL). Independent uplinks include Appalachian Regional Commission (Lexington, KY), C-SPAN (Washington, D.C.), ESPN (Bristol, CT.), Southern Satellite Systems (Atlanta, GA), SIN/Galavision (Los Angeles), CBN (Virginia Beach, VA), PTL (Charlotte, NC), Satellite Systems (Buffalo, NY), KTBN/Trinity (Los Angeles and SIN) San Antonio, TX).



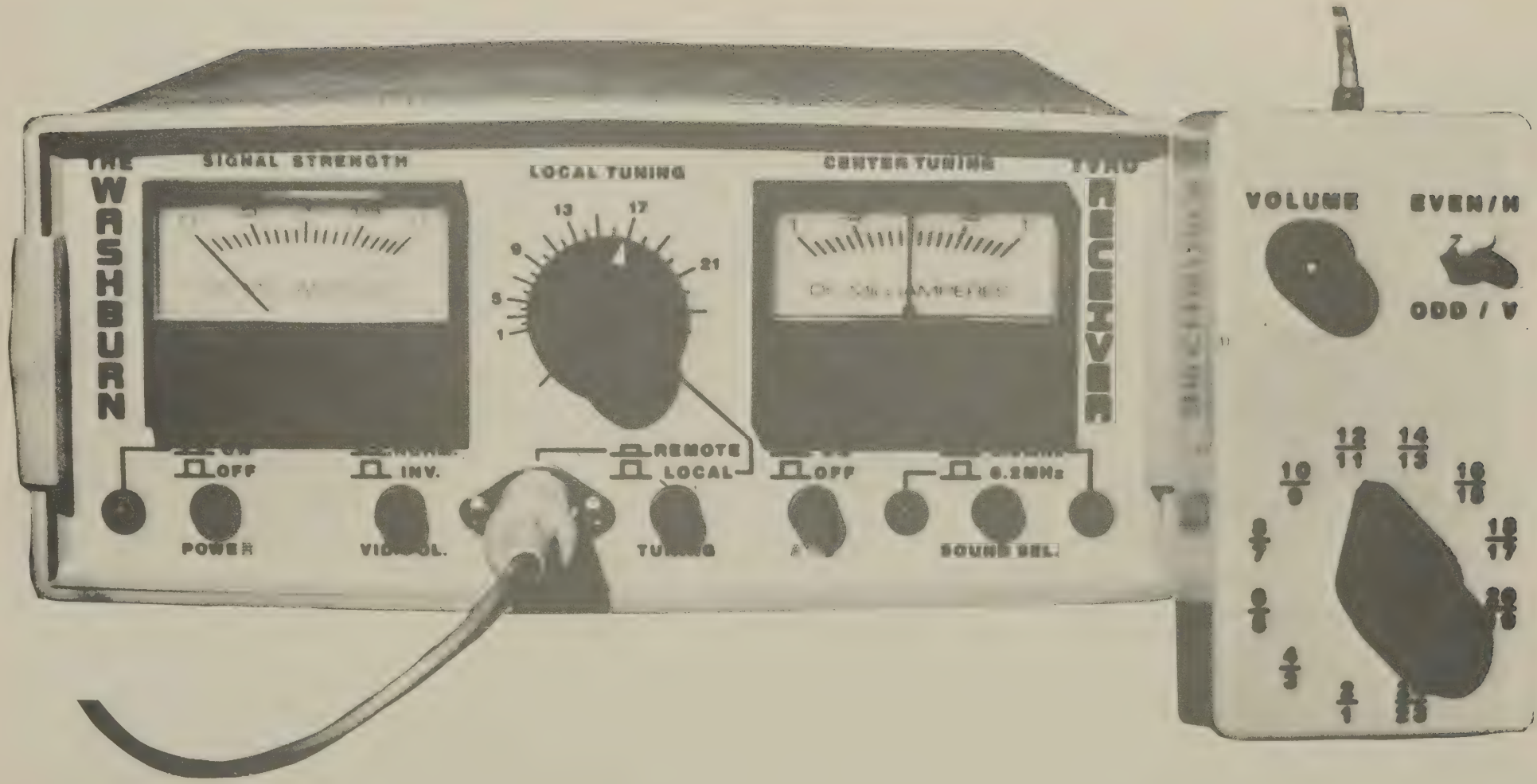
INTRODUCING: ADM's ELEVEN FOOT SATELLITE ANTENNA



FEATURING

*EXTRA MARGIN of performance over 10' parabolics
*EASILY SHIPPED and fast, precise assembly and set-up
*QUALITY aluminum construction, fast delivery to you
*CHOICE of mounting options
*WRITE for full details on this exciting new field-proven satellite antenna!

ANTENNA DEVELOPMENT AND MANUFACTURING, INC.
2745 Bedoll Av., P. O. Box 1178, Poplar Bluff, Mo. 63901
Telephone (314)785-5988



THE WASHBURN TVRO RECEIVER -

Elegant. Superb performance with optimized PLL high-recovery-ratio circuitry. Full operational metering. Handheld remote control. Double conversion, tuneable 24 channel. Selectable audio subcarriers. Commercial stability and much more.

Build it. From the highly detailed new STT manual. Full board layouts, parts location drawings, total parts sourcing, detailed step by step alignment. Or from commercially available parts kits. STT's Washburn TVRO Receiver Manual is available now. See order card in this issue of CSD.

STT Satellite Television Technology / P. O. Box G
Arcadia, OK 73007 [405-396-2574]

INSIDE THIS ISSUE

Japanese Hardware Arrives

12 GHz TERMINAL DATA

Do It Ourselves?

A VIEWER'S TRANSPONDER

Gearing Up For San Jose

SPTS '80/CALIFORNIA

Another Price Drop

$695 RECEIVER KIT

COOP'S SATELLITE DIGEST

MAY 1980

PARAFRAME

Paraframe™ Announces

A NETWORK OF DEALERS TO SERVE YOU BETTER

BASIN ELECTRONICS
P. O. Box 2105
Durango, CO
(303)259-0458

JOHN L. DAVIS
83 Westello
Pocatello, ID 83201
(208)232-2606

REEVES COMMUNICATIONS
1550 West Court St.
Kankakee, IL 60901
(815)937-4519

JERRY PEAKE CO., INC.
2328 Montgomery St. (lower level)
Silver Springs, MD 20910
(301)587-2515

MID-CONTINENT EARTH STATIONS
P. O. Box 81673
Lincoln, NB 68501
(402)474-5486

CFP COMMUNICATIONS
2215 Smith Road
Horseheads, NY 14845
(607)739-2027

NU-VIEW TV, INC.
218 Main Street
Oriskany Falls, NY 13425
(315)821-7225

SMITH RADIO-TV
P. O. Box 62
Ely, Nevada 89301
(702)289-2282

RED'S TV SERVICE, INC.
Fountain Hwy.
Farmville, NC 27828
(919)753-3074

AYERS & JOHNSON
Sevierville, TN
(615)453-6842

TOWER ENTERPRISES, INC.
442A West Pike Street
Clarksburg, WVA 26301
(304)623-3238

CANADA

KAMLOOPS COMMUNICATIONS, LTD.
913 Laval Crescent
Kamloops, BC V2C 5P4
(604)374-5740

S. FLORIDA & CARIBBEAN

A.B. ELECTRONICS & COMMUNICATIONS
1783 W. 32nd Place
Hialeah, FL 33012
(305)887-3203

DEALER INQUIRIES
Direct to:
Bob Christofanelli
Satellite Systems of Illinois
261 W. Sauk Trail
South Chicago Heights, IL 60411
(312)755-5400

PARAFRAME ANTENNAS are the only antennas **that can be** 'proofed' **on site to render maximum real-world gain.** BEFORE **your Paraframe antenna has been aimed you** KNOW **it will give superior performance!**

PARAFRAME

PARAFRAME, INC. P. O. Box 423
1000 Sunset Dr. West, Monee, IL
60449 / (312)534-7435

COOP'S COMMENT ON TECHNOLOGY

GEAR IS MOVING

I am delighted to report that equipment is now starting to move in some volume from our young industry's overloaded suppliers into dealer and distributor hands. I would have liked to do a company by company run down for you here so that we don't play any favorites or miss someone important but the closeness to the publication deadline of this issue will not allow that. So my apologies in advance for not catching everyone.

H & R (STARVIEW) has been able to ship nearly 100 systems since Miami and is averaging 2-3 new antennas shipped per day. In that have been around 15 of their trailer-mounted demo rigs which allows a dealer/distributor to pull up to a prospect's location and be delivering pictures in typically under 30 minutes time.

STAR (Satellite Television Systems) is also shipping in quantity their 13 foot terminal and they have about the same number (14 or so at this writing) of their trailer mounted rigs on the road.

PARAFRAME had recently completed plans to have their antenna's fabricated in a second plant (in West Virginia) and Jim Vines has created a second source for his laminated ribs in western Canada. After fighting the Chicago high-priced labor and job-shop market for more than a year, Vines has finally worked out some impressive back-up arrangements that will allow Paraframe to greatly increase production quantities and lower pricing.

A number of terminals installed during late March and April went to some very interesting buyers. Filling an order from SPTS Miami, STARVIEW put a terminal into the Dominican Republic; and then followed that up with three more to the same island. STAR/Satellite Television Systems saw to it that terminals were installed for Tammy Wynette and the offices for the Bee Gees.

LNAs are **not hard to find** although at least for now the suppliers seemed to have learned their price-war lesson of last summer. The LNA supplier went into last summer afraid the bottom was dropping out of their market so a price war ensued. It wasn't too long before the quasi-distributors in the cable/professional field were screaming because manufacturers were cutting single unit prices below what they had paid weeks before. The price war stopped as suddenly as it began. Supplies now are higher than at anytime before, off-the-shelf delivery is available everywhere, but the prices are staying up in the $1,000 range (120° K, 50 dB gain). Strange, but true.

Receivers - here's where the bottle neck is. H & R has moved around 100 of the ICM's since Miami. AVCOM is running at capacity and Andy Hatfield is carefully studying enlarged quarters to expand production again. The Ramsey-built Washburn's are starting to trickle off the line but the wait is very long. As reported elsewhere in this issue, Taylor Howard has reached agreement on producing his receiver in quantity (5,000 up per annum) but it will be San-Jose-time, I believe, before we start seeing quantity production. Robert Coleman has lots of people pressuring him to produce. He's undecided but notes his single conversion design might be ideal for a group that was interested in only (say) transponders 2 and 8; the two most popular religious transponders. For right now however receiver deliveries (or lack thereof) continue to keep a lid on growth.

After talking with the suppliers named and a few more I think I have a handle on how many 'private terminal packages' got out the door during the four week period from mid-March to mid-April. Ready for this? Around 120. Not bad for the first real first-month-subsequent to SPTS '80 Miami.

Now, can that number be doubled? **YES** - if you carefully state **when** it can double. By San Jose, I think we could see a mini-industry here turning out 250 brand new antennas and receivers each month, strictly for private terminal use. And again, LNAs don't look to be a delivery problem; only a pricing problem.

Is that the bottom line? Hardly - as this issue reports new products and yet lower prices are coming on fast and San Jose will see them prominently displayed. To those who have worked so hard to get gear moving; congratulations. To those who are going to help us double it by San Jose, keep on burning that midnight oil!

OUR COVER - MAY 1980 CSD

The father of electronic television - Dr. Vladimir Zworykin - was an unscheduled visitor to Miami's SPTS '80. He talked briefly to the assembled throng, toured the exhibits and mused that when he first took his operational television project to RCA's General Sarnoff he never envisioned it would go so far in his lifetime. He recalls one set of executives viewing his all electronic system and then telling him "That's all very nice, but what good is it? What can it ever be used for?".

CSD TECHNOLOGY

COOP'S SATELLITE DIGEST (Technology Section) is published monthly by Robert B. and Susan T. Cooper doing business as Satellite Television Technology (Ltd.), P.O. Box G, Arcadia, OK 73007 (USA); 405-396-2574. **CSD** is not affiliated with any satellite programming distributor, hardware (equipment) manufacturer or distributor nor satellite systems operator. STT sponsors the Satellite Private Terminal Seminars (SPTS) held three times per year and does produce and distribute 'learning' materials and 'how-to-do-it' manuals relating to the development of the low-cost satellite TV receiving system industry. Subscription fee is $50 (US funds) in advance Canada, US, Mexico; $75 (US funds) elsewhere. Copyright 1980 by Robert B. and Susan T. Cooper.

PRACTICAL CIRCUIT TO RECOVER MOLNIYA AUDIO/VIDEO

In the last installment of this look at recovering high quality video and audio from the Russian Molniya/Orbita series inclined orbit satellites we looked at the problems created by the Russian SECAM color system, their 50 Hz operation for sync reference and the unusual PWM audio system. In this installment we will zero in on the recovery of the PWM audio and the re-establishment of locally generated sync to make up for the 'damage' created by the PWM pulses transmitted with the normal sync signals.

The before and after of the sync portion of the transmitted video/audio is shown here. Also included is a detailed schematic of a system created by Birkill to handle this problem.

THEORY OF OPERATION

The input video us terminated and emitter followed. It then splits to feed the sync separator (top line) which applies positive-going separated mixed syncs to the 50 microsecond monostable. The trailing edge of the 50 microsecond pulse is used as a trigger for two additional monostables. The first is of a design range of 8 to 20 microseconds and it times the 3.5 microsecond pulse used to gate the audio pulse out of the video waveform. The control for this variable period (a 5K pot) should be installed on a front panel. Consider it as sweeping (in time) the gating pulse across the blanking interval that contains the audio pulses. It should therefore be set (adjusted) to select the pulse required for decoding. Remember that there are two pulses but that often only one is modulated; the adjustment is simply for clear (distortion free) audio. Once set it should hold unless the timings of the Russian waveform change appreciably. An example of when this might happen suddenly is as they air an old type 0249 monoscope test pattern (card). Other than changes in the Russian timing at the uplink site, the system should be very stable for on-going copy of the Russian audio.

The second monostable directly triggered from the 50 microsecond pulse is a preset variable period around 8 microseconds. Its function is to determine the starting point of the regenerated line (horizontal) blanking period. The preset control should be set such that the regenerated blanking sits exactly over the original 12 microsecond blanking period without erasing any of the picture on either side. On a displayed picture the effect is to shift the picture left or right on the screen, revealing a black vertical bar if incorrectly set (i.e. you see the edge of the original blanking). The trailing edge of this variable 8 microsecond pulse then triggers (1) a 12 microsecond monostable to generate a new blanking, and, (2) a pair of monostables to generate a new front porch and line sync pulse. These timings are shown as being set by fixed components and they should be close enough for the application here without variation.

Prepared from data supplied by:
Steve J. Birkill
128 Cross House Road
Grenoside, Sheffield
S30 3RX, England

Meanwhile the video from the emitter follower has its sync pulses DC restored to +0.7 V and that is passed through a further emitter-follower. This splits to feed a 710 comparator and to have new line syncs and blanking imposed. The mid-amplitude of the audio pulses is at about +0.6 V at the non-inverting input of the comparator. The potentiometer on the inverting input should be set at approximately this value though it may be subsequently adjusted for best audio signal-to-noise ratio. (To minimize the number of user adjustments the pot could be replaced by a pair of fixed resistors. From the inverting input, 2.4K to the +5 V line and a 3.6K to the minus 6 V line should do the trick. Pin numberings on this IC are for the DIL package version.) The comparator's output consists of mid-slice video with audio pulses positive-going at TTL logic levels.

The waveform is gated with the 3.5 microsecond pulse in a 7401 open-collector NAND-gate. The resulting output is a negative-going pulse recurring at the line frequency of 15,625 Hz and width-modulated at the audio frequency. The mean level of the waveform varies with the audio modulation so all that is required to remove the 15.625 kHz component is a CR network. The resultant audio is fed out via an emitter follower. On all Russian audio circuits the maximum modulation frequency is 7.5 kHz.

The DC restored video signal with syncs at 0 V and the blanking level at 0.3 V has new line blanking applied by a second open-collector NAND gate. This is driven by the 12 microsecond pulse. This operation removes the audio pulses and the original line syncs. The portion of the frame sync waveform outside the line blanking period is unaffected. A parallel-tuned circuit, resonant at the mean value of the SECAM color subcarrier frequency (4.33 MHz) prevents removal of color synchronizing information in the reblanking process. The 15K resistor restores blanking level to its correct value of 0.3 volts. A pedestal is not normally applied in the 625-line system; black level and blanking level being the same. The value of this resistor can be changed if output pedestal or sync amplitude are incorrect.

A further open-collector gate applies the re-timed line sync pulses and the re-constituted video waveform feeds an output emitter follower, at 75 ohms.

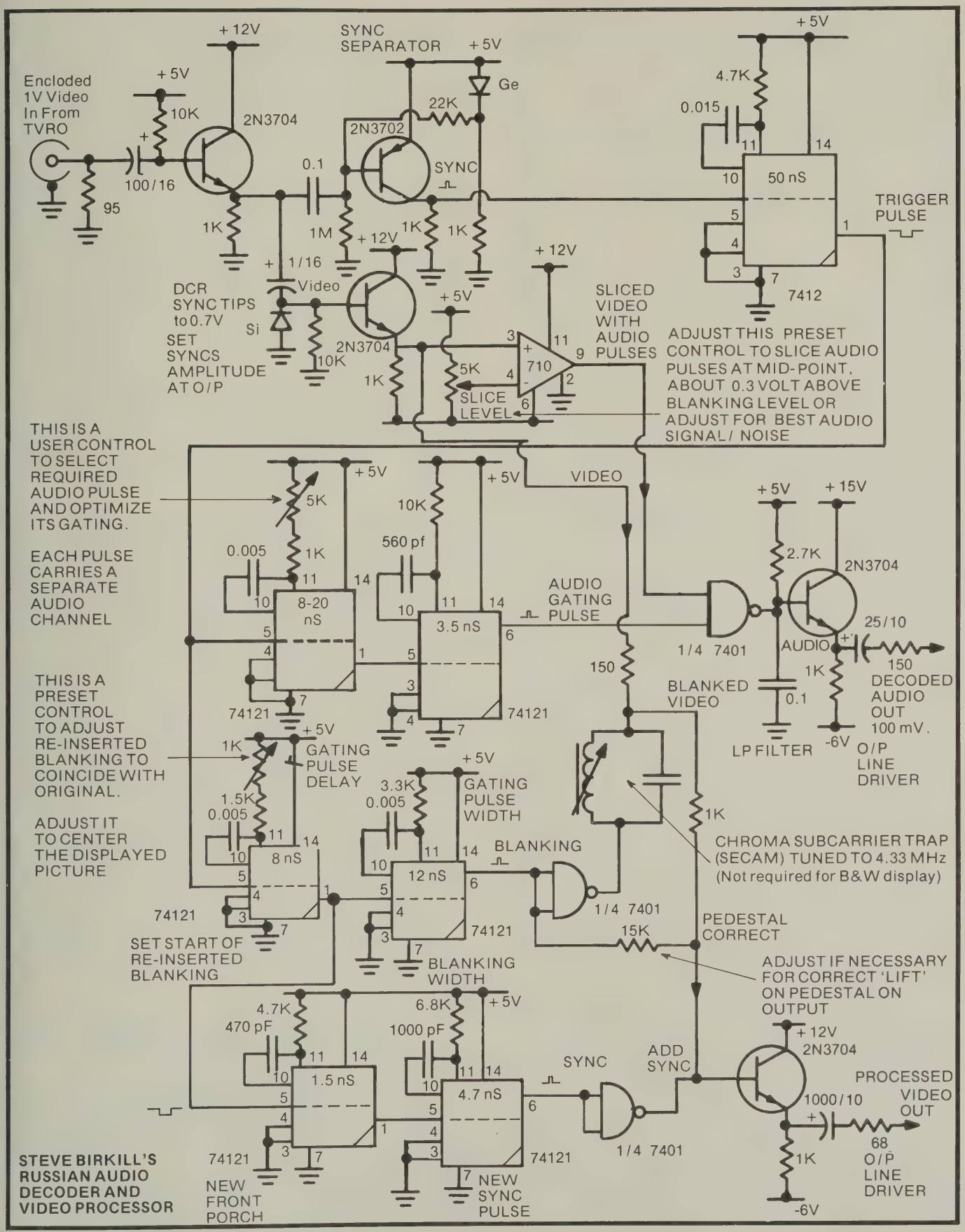
NON STANDARD

In addressing this 'problem' with this solution one ends up with a high quality (although non standard) output waveform in the frame sync region. To correct this to standards which would be suitable for broadcast specifications would require considerable additional circuitry and it is unlikely that anyone making this adaptation intends to plug directly into an NTSC video line feeding a television broadcast transmitter anyhow! On a normal picture monitor or for local redistribution via a typical cable modulator the difference should not be noticeable.

SUMMARY

Again we note that the direct appeal of this system to most **CSD** readers will not be for you to promptly run out and build this 'decoder' gadget. However by making this material available to you we hope that you begin to grasp some of the significant video parameters in use in the world, and also recognize that with a little creative engineering the TVRO terminal of today can be equipped to recover satisfactory audio and video even from complex non-standard sources.

The next time somebody tells you that reception from non-NTSC standard birds is simply not possible with North American receiving equipment, recall this treatment for conversion of the Russian system to NTSC display; adaptions for PAL and other standards in use around the world are by comparison 'a piece of cake' when compared to the differences presented to us by the Russian SECAM and PWM system. In future reports we will look at how these lesser-grade differences can be accomodated with an NTSC receiving terminal.



STEVE BIRKILL'S RUSSIAN AUDIO DECODER AND VIDEO PROCESSOR

12 GHz JAPANESE TERMINAL DATA

Those attending the Miami SPTS '80 earlier this year (see **CSD** for March 1980) had the opportunity to visit with Vitalink Corporation's James Janky concerning his plans to import into the United States a 12 GHz receiving terminal package for distribution in the U.S. and Canada. At that time VITALINK's plans were in a very evolutionary state and pricing kicked around at the Miami show centered in the $1200 to $1500 region per terminal for 12 GHz. At least one Canadian buyer purchased six packages on the spot.

During April VITALINK was able to firm up the details of the package and to put down some hard pricing information. The packages are intended for reception from the Canadian ANIK-B bird (see **CSD** for March); a dual band satellite currently operational with television programming on both the 4 and 11/12 GHz downlinks.

Janky's firm calls the 12 GHz terminals **GIGAPIX-12** systems and they consist of the following:

1)An outdoor unit designed to receive the 12 GHz FM video/audio and downconvert it to a 900 to 1200 MHz "high IF" for transportation (as an FM signal) through a piece of 75 ohm coaxial cable to an indoor unit.

2)The indoor unit contains a second mixer that downconverts into the mid VHF range where the signal is further (IF) amplified and then detected in a discriminator circuit. This detected video and (sub-carrier) audio is then applied to a VHF TV channel remodulator which produces a 'standard' NTSC signal on one of the lower VHF television channels.

The VHF remodulated signal is looped to a standard TV receiver for display.

The package does not include an antenna nor antenna mount, nor the coaxial cable required to inter-connect the SHF outdoor unit to the indoor UHF/VHF unit. We'll talk about antenna options shortly. A block presentation of the system appears here.

The input to the SHF downconverter is a WR-75 flange; the standard flange for this frequency range. Powering to the SHF unit at the antenna is through the coaxial cable (i.e. powering is duplexed); a -12 VDC level. The appearance of the outdoor package is similar to the die-cast aluminum housing one sees hanging on cable TV lines all across North America.

The indoor unit is a table top design with five push buttons for selection of any of five channels of SHF video from the bird. It operates from standard 110 VAC power mains.

Now the pricing scramble. The pricing floating about Miami and subsequently reported in the March issue of **CSD** was not correct. Actually it was correct at the time, but a massive misunderstanding between the Japanese suppliers and Vitalink was the fault; the Japanese chaps were quoting pricing based upon the delivery of "very substantial quantities" of the packages to North America and when Vitalink went back for a smaller initial quantity the pricing jumped upwards. So what does this package cost, less the antenna, transmission line (most any 75 ohm cable will do although you have to be careful of what 75 ohm line you select as a function of line length from downconverter to inside unit) and the antenna mount? **Vitalink** (701 Welch Road, Suite 225, Palo Alto, CA 94304; 415-328-4972) says you can buy one for $3,000 (U.S. funds).

Is that the end of the pricing discounts? No, but everyone has to crawl before they can walk in this exercise and pricing varies according to quantity. Janky advises that if one distributor orders say 100 units, the pricing to the distributor drops to $2,000 per terminal package. Anyone seriously interested in a really large quantity, say 1,000 units, will need to talk with Janky.

Now what about the balance of the system? That is, how much more money will a chap spend to get the sytem operational?

Let's take the antenna first. 12 GHz antennas have never (to date) been produced in quantity. They are close to being 'job-shop' items with the major suppliers and there are both job-shop pricing and job-shop delivery delay frustrations involved here. If you think you want to get into the 12 GHz business, be prepared for both problems. **CSD** surveyed a pair of the two better known antenna houses for this package and here's what we found.

1)**Prodelin** (P. O. Box 131, Highstown, N.J. 08520) has a pair of applicable antenna product lines available. One is their 'Satellite' antenna line and the other is their standard 'Terrestrial' antenna line. As nearly as we can tell the primary difference between the two lines is the name they call it by; in fact spec for spec in some areas the terrestrial line may even be a better choice (gain for example is **slightly** higher).

In fact when Coop first installed a test 10 foot terminal two years ago the antenna chosen for that experiment was a ten foot Prodelin **terrestrial** antenna with their standard button hook feed. The mount was also a standard **terrestrial** mount, which as we shall see now can save you substantial dollars.

In the **satellite** antenna line Prodelin has a 6 foot (model 203-750) which has 44.6 dB of gain, WR-75 flange (to mate directly with the GIGAPIX 12 flange) and a $895 list price. The **terrestrial** antenna applicable is their 203-740 and it has 44.8 dB of gain and lists for $590.

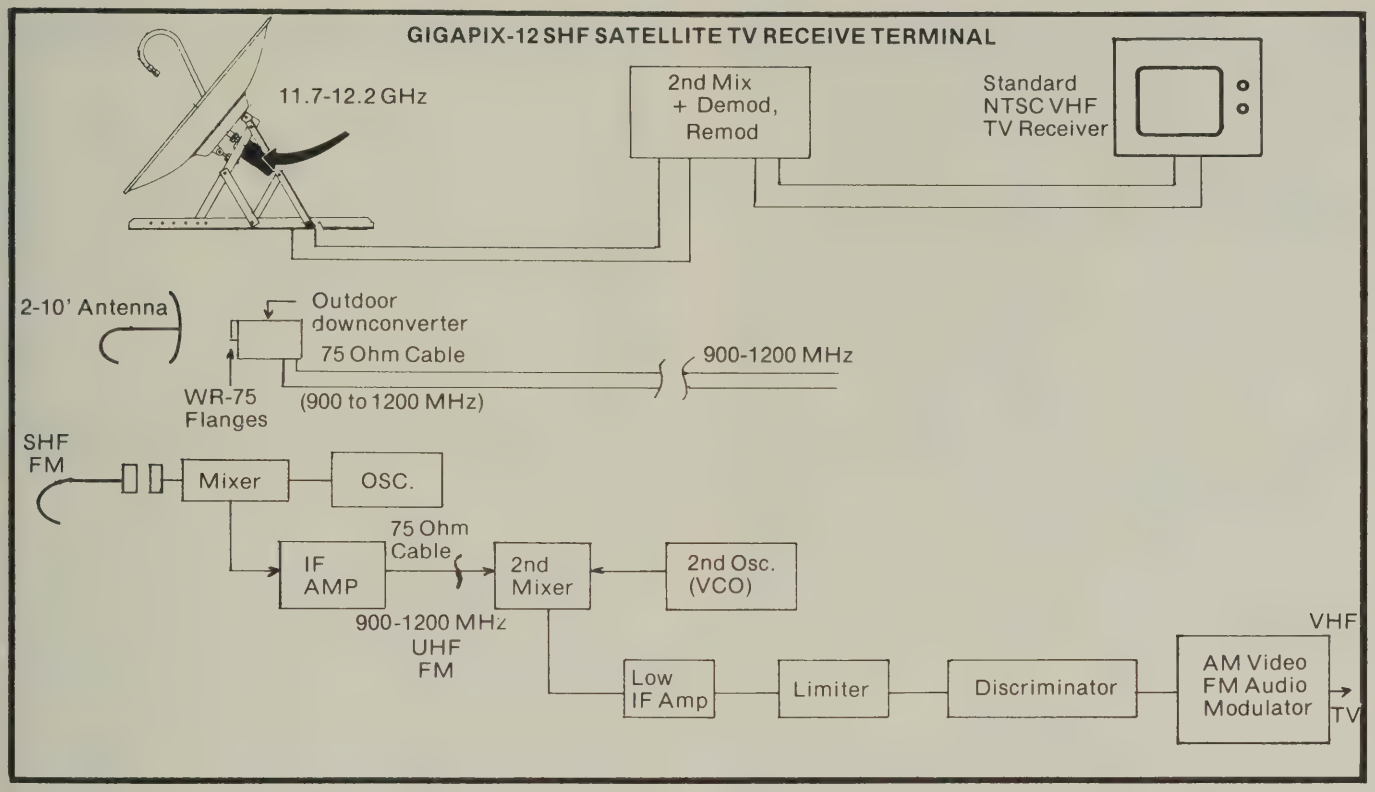
A manually adjustable az/el mount available in the satellite line (model 120-140) lists for $1385. However, over the terrestrial line there is something called a 'tilt mount' which bolts onto a piece of 4.5 inch (OD) pipe that allows the same manual adjustment of azimuth (360 degrees around the pipe) and elevation (from -5 degrees to +50 degrees with a 10 degree vernier 'fine' adjust). The model number is 45-140 for a (4 or) 6 foot antenna and the list price is $285. Prodelin also has 2' (201-740 at $375), 4' (202-740 at $485), 8' (204-740 at $850) and a 10' (205-740 at $1400) in their terrestrial line. A tilt mount for the 8 or 10 foot is their 46-140 ($595).

This suggests a six foot antenna (terrestrial 203-740) offering 44.8 dB of gain plus a 45-140 tilt mount can be combined for around $875 and a really clever person could get the tilt mount built locally for around $100, further saving another $175 or so. And that says that the antenna (if a six foot is the right size for your location) can be a $700 package on top of the $3,000 onesy-quantity GIGAPIX-12 receiver. The coax? RG-59 if the run is very short (say 25-35 feet); RG-11 for up to perhaps 75 feet and .412 or larger aluminum jacketed cable for longer runs.

2)**Andrew** (10500 W. 153rd Street, Orland Park, IL 60462) has a series of terrestrial antennas available covering 12.2 to 12.7 GHz. They will work just fine down to 11.7 GHz.

Like the Prodelin antennas we have WR-75 flanging here ready to bolt against the mating flange on the GIGAPIX unit. The Andrew P6-122C is a six footer with 44.7 dB of gain (at 12.2 GHz) and a price tag of $590 list. Also available is a four footer (P4-122C at $480), an eight footer (P8-122C at $980) and a ten foot version (P10-122C at $1580).

There are two mounts available; their VT6 is similar to the Prodelin tilt mount and sells for $140 and the VT10 is the larger version for the 8 and 10 foot models for $260. Also, there is a



ground (or roof) mounting tilt mount; the HT6 for 4 and 6 footers at $240 and the HT10 for 8 and 10 footers at $460.

So for the 6 foot Andrew (P6-122C) and the VT6 tilt mount you will have around $730 invested (list pricing). Note however that all antenna pricing in this field is 'FOB point of origin' and that in many cases the shipping charges and crating charges may add up to almost as much as the antenna. Check first if you are concerning about charges; they are not cheap. (One Canadian who bought a ten foot dish in the states told us during the Miami SPTS that the freight bill to Ontario came to something like $1700 !).

ANIK B Coverage

The only bird in the sky for North America viewers with regular 12 GHz (video) signals on it at the moment is ANIK B. Coverage from ANIK B is supposed to be in a set of beams centered into northern Ontario and northern British Columbia. If one **believes** the footprint data, coverage into the U.S. will **not** extend much below the border area. Jim Janky of Vitalink suggests a sparklie-free picture in the Chicago area, for example, will require a ten foot dish.

The present ANIK B signals are but 6 dB hotter than U.S. domestic 4 GHz signals and the 'rumor' that you can tap into the 12 GHz circuits with 18 inch dishes is far into the future when the 100 to 200 watt-per-transponder satellites go into operation. For now, getting 20 watts of TWT power per channel is pushing the state of the art.

This final thought. The same ANIK B's 4 GHz signals are available at reasonably good levels (sparklie free on 13 foot dishes with 120 degree LNAs) far south into Florida. The ANIK B operators deny this is possible but those of us who saw the pictures during SPTS '80/Miami know differently! It is possible [**but only conjecture**] that if the 4 GHz signals from ANIK B are extra-hot that far south that the 12 GHz signals may also extend (at useable levels) further south than the published data suggests. There is only one way to find out...and that's to go looking for it!

SMALL SYSTEM RECEIVER TECHNOLOGY

A COMMERCIAL HOWARD RECEIVER

The popular Taylor Howard receiver, seen in its latest form at the Miami SPTS '80, now appears headed for commercial production with first units due to be off the production line around the middle to end of June (just ahead of SPTS '80 in California).

Following up from Miami's SPTS, Howard has reached agreement with two separate groups to produce the receiver under his guidance. One version of the receiver will be produced partially in California and partially in Australia for a firm that will distribute them in Australia. This particular version, designed for INTELSAT reception, will have a front panel two-position switch for either channel 'A' or 'B'. This switch in turn is 'programmed' with chassis mounted (dip) switches which allow the system installer to align any two (1/2 transponder) format channels with the 'A' and 'B' position switch. For those who would ask **"What do this..."** the answer is simply that the Australian marketplace, government regulated to some extent when it gets off the ground this fall,

LET'S SEE- 5,000 radios per year...Fraser Hickox of Sydney, Australia [right] seems to be pondering the magnitude of his project with Taylor Howard [left] during a session at Miami's SPTS this past February.

wants to be sure that 'rural satellite TV viewers' do not have the **ready**-accessibility to **all** of the transponders that will ultimately become available to them; some of course not being 'broadcast' television. With this announcement that a Howard INTELSAT receiver is going into production for Australia and the Pacific comes another report that some tests through INTELSAT of a 1/2 transponder spotbeam television service, boresighted on Australia, will begin as early as this coming September. These tests are to be conducted by the Australian government and via these tests 'outback' Australians will gain access to their first realtime television. The **tests** are expected to last until the Australians have their own (12 GHz) bird in operation in the mid '80's.

On the domestic front Howard has reached agreement with a western Canadian group calling themselves **Satellite Supplies** (604-859-6359) to manufacture a $1300 price range (quantity one) receiver with the following features:

1)Twenty four channel tuneable
2)Dual audio subcarriers
3)RF output in the UHF TV range (i.e. remodulated)
4)Keyboard input (i.e. you punch up the desired transponder with a keyboard that drives a small microprocessor)

This version of the Howard receiver will also have as options a remote control system that allows the transponders to be selected from the 'easy chair'.

Howard reports that he has been able to design 'around' the two primary long lead time items which other manufacturers have been experiencing some difficulty in obtaining. The double balanced mixer (many radios use the Vari-L DBM500) has been replaced with a mixer of Howard's design while the especially difficult-to-obtain VTO (such as the Avantek 8350) has been completely replaced with a frequency snythesizer which Howard has developed. **"This is a major breakthrough for us"** notes Tay **"simply because we will not be dependent upon an outside supplier who is perhaps incapable of supplying us with the parts we need to produce large quantities of these radios".** The large quantities Howard alludes to here are in the 5,000 radios per year range upwards. The North American producer, Satellite Supplies, has been reported quoting prices of $894 per radio in 1,000 quantity lots in case you are interested in getting into this business in a big way!

YES - you can expect to see both of these versions at SPTS '80 in San Jose over the July 4-6th weekend.

WASHBURN RECEIVER UPDATE

ERRATA #4

Reference PLL demod assembly A2A1A1...

1)**L5** has been **added** in series with R20 (150 ohm) to suppress noise remodulation effects that unnecessarily raised the SNR threshold. This is an 0.82 uH miniature choke (Delevan 1025-18) and may be readily mounted by lifting one end of R20 and installing L5 between the now empty hole and the elevated end of R20. This was the final update to the demod before a series of SNR threshold tests that indicate a receiver threshold of **7 dB** for all deviations encountered in video modulation.

2)More experience with the receiver has indicated that step #7 (appearing on page 22 of the manual) may be simplified as follows:
With the 70 MHz generator still connected, plug P1 into A2A1 J1 and adjust A2A1A1 R9 (on demod assembly) for a centered reading on the center tune meter with the **AFC off**. (Check mechanical zero adjustment of the meter with power off prior to performing this step.)
The front panel signal strength meter can be used to obtain an accurate measurement of the true CNR delivered to the receiver by your antenna and LNA with the following procedure.
"Broadband noise will..." (continue with text).

Reference Assembly A2A1...
The following errors on the assembly drawing (figure 18, page 27) have been noted:

1)**R65 is not shown**, it should be directly above R64.
2)**Designator CR11** was utilized twice; the diode just **below** S5 should be changed to **CR14** (Change schematic also and add to parts list by changing entry to CR3,11,**14** - total quantity **3**). Delete the duplicate entry of CR12,13 two lines below this.
3)**The band**(ing) on many of the diodes was left off the final manual art and should be applied as follows:
a)**CR1** - band on **right**
b)**CR2** - band on **left**
c)**CR3** band on **left**
d) **CR4 and 5** - band on **left**
e)**CR9** - not shown, **draw** in between R67 and R35 with band at **top**
f)**CR10** - not shown, **draw in** above CR4 with band at **right**
g)**CR11** - band at **bottom**
h)**CR12** - band at **left**
i)**CR13** - band at **top**
j)**VR1** - not shown, **draw in** above R32 with band at **right**
4)U4, just below R33, is **incrorectly labeled** Q4.
5)**R18** is incorrectly shown on the parts list as 1/4W; it should be **1/2W**.
6)The diode symbol at DS1 is reversed and should show show the cathode end to the **left**.
7)U4 is incorrectly shown on the parts list at TL431CP; it should be TL431**CLP**.
8)The following component value changes have been made:

a)**R34** has been changed to **300 ohm** (same type) to equalize the brightness of the green and amber LEDs.
b)To rpevent pick-up and amplification of strong local TV and FM signals the following changes have been made to video amplifiers U1 and U2:
1)**R2** is now **24** ohms (same type)
2)**C2** is now **390** pF dipped mica, CM05FD391J03
3)**C2** is now **5.0 or 5.1** pF disc ceramic, Sprague 10TC-V50
4)**R10** now **30** ohms, same type
5)**C7** now **390** pF dipped mica, same as C1 above
6)**C8** now **5.0 or 5.1** pF disc ceramic, same as C2 above
7)A 1.8 pF disc ceramic (Sprague 10TCC-V18) has been **added** from source to drain of Q1 (or, U2-1 to ground) to equalize the inverting and non-inverting frequency response of U2. The new capacitor is **C38** and it is mounted **below** the circuit board.
8)Video amplifier U2 has been found to give better linearity at high frequencies with additional loading at its output. Thus, **R73** (680 ohm, 1/4W carbon comp or film) has been **added below the PC board** from U2-8 to U2-3 (-8V supply). Sufficient current is still available for the peak current demands of clamp diode CR1.
9)The +8V connection from U1 to U2 has been found to have resonances that may cause frequency response variations at the high end of the video range. The 'cure' is breaking the +8V trace that goes **below** C2 and R7 and **installing** a ferrite bead **below** the PC board (same type ferrite as others).
10)A trace jumpering U10-7 to U10-7 was omitted on the PC boards and **should be added** with a short wire, as this is the +8V supply to U10-6.
11)Delete E15 from both the Processor (figure 16) and the Demod Console/Remote schematics (figure 19) as all front panel ground points may be readily wired together and returned via Processor E4.

Processor Assembly A2A1/Downconverter A1A1

It has been found that some VTOs will not track to the dial scale shown on page 26 of the Washburn Manual and thus will not allow proper set-up of the remote control box due to high mixer VSWR under full (over 20 milliwatt) drive conditions. The cure is to **pad the VTO output** to the recommended mixer input level (5 mW) with the pad giving the extra insurance of the low VSWR to the VTO. Some change in the tuning scale is necessary; however, repeatability from unit to unit is now excellent. The specific changes are as follows:

Down Converter A1A1:

1)**Cut** a 0.156'' gap in the middle of the trace from U3-4 to J1 center pin. Solder a 39 ohm **1/8th watt** carbon comp. resistor (R12) across the gap.
2)**Add** a 150 ohm **1/8th watt** carbon comp resistor (R13) from U3-4 (output) to U3-3 (ground). Use **very** short leads.
3)**Add** a 150 ohm **1/8th watt** carbon comp resistor (R14) from J1 center pin to any of the four corner ground pins on that connector. Use **very** short leads.

Processor Assembly A2A1:

1)**Delete** C19, CR3, R30, R31 and U5.
2)**Replace** CR2 with a jumper and jumper the holes for U5-1 to U5-0 (upper two holes on assembly drawing figure 18).
3)**Change** R28 to 2.0K, same type
4)**Change** R27 to 330K, same type
5)**Change** R32 to 10K, same type
4)**Cut** the trace from U4-C to the lug on S3 just above the one labeled E7 on figure 18. The middle lug should be labeled as the ''new'' E9 (cross out the 'old' E9).
7)**Connect** a 1.0 UFD tantalum (same type as C22, **new** part is C39) across the leads of a 3.0 K +/-5% carbon comp resistor (1/4 watt); R74. Solder the resistor lead connected to the **negative end** of C39 in the 'old' E9 hole. Connect the other resistor lead to the 'new' E9 on S3.
8)**The resistance chart** on page 26 should now be changed to read as follows:

NEED PARTS...
Sat-tec's Got 'em!

70 MHz DEMODULATOR CARD

The Sat-tec D-1 demodulator is the last block in a TVRO system, it is where the 70 MHz IF signal is converted to video and audio. The D-1 contains a PLL demodulator, video processor (CCIR de-emphasis, 4 MHz low pass filtering and 30 Hz clamp), dual sound sub-carrier demod and AFC circuitry. The power requirement is small, 15 VDC @ 200ma., signal input is -20dbm @ 70 MHz. AFC will enable the user to lock most any VTO L.O. with no problem whatsoever. Video and audio outputs are a standard 1 volt p-p suitable for driving any monitor, VTR, or modulator.

SPECIFICATIONS:
Signal input: 70 MHz at 20dbm (22mv)
AFC lock range: greater than 5 MHz
Sound subcarriers: 6.2 MHz and 6.8 MHz fully independent
Video level out: std. 1 volt p-p
Audio level out: 1 volt p-p
Power requirements: 15VDC @ 200 ma
Demodulator: NE564 PLL IC
Tuning voltage out: 2 to 13.5 volts
Tuning voltage in: 0 to 15 volts max

D-1 Demodulator Kit $99.95
D-1 Demodulator PC board only $49.95

Part Number	Description	Price Each
Avantek GPD 1002	1 GHz, 12 db gain TO-8 can amplifier, 15 VDC	$45.00
Watkins-Johnson V802	2.5-3.7GHz VTO, lower noise than Avantek types	120.00
Watkins-Johnson V705	600-1000 MHz VTO, lower noise than Avantek	120.00
Signetics NE564	PLL selected to operate at 70 MHz	7.50
Van-L DBM 500	4 GHz mixer, SMA connectors	85.00
Amperex ATF-417	1 GHz, 25 db gain hybrid amplifier, 20-24 VDC	19.00
Motorola MWA-110	400 MHz, 14 db gain, -2.5 dbm	9.00
Motorola MWA-120	400 MHz, 14 db gain, +8 dbm	9.75
Motorola MWA-220	600 MHz, 10 db gain, +10.5 dbm	12.40
Motorola MWA 230	600 MHz, 10 db gain, +18.5 dbm	13.50
Motorola MWA-310	1 GHz, 8 db gain, +3.5 dbm	12.40
Motorola MWA-320	1 GHz, 8 db gain, +11.5 dbm	13.50
Motorola BFR 90	3 GHz F_t NPN transistor, 15 db gain @ 1.2 GHz	2.50
Motorola MRF 901	3 GHz F_t NPN like BFR-90 but 2 emiter leads	2.75
Regulators 7800 Series	5V, 8V, 12V, 15V, 1A TO-220	1.50
Regulators 7900 Series	-5V, -8V, -12V, -15V, 1A TO-220	1.75
IF Transformer	10.7 MHz IF can be padded to 6.2 or 6.8 MHz	1.25
Tuning capacitor	10pf multi-turn for filters, PLL, etc	95
Coil form + can set	Nice coil form set for filters, good to 120 MHz	2.00

Sat-tec Systems; Box 10101
Rochester, NY 14610; (716)381-7265

SATELCO- High Quality Private Terminals

SPECIALISTS IN OVERSEAS systems for domestic and Intelsat television reception, fast processing of export orders and design and sytems for 'difficult' reception areas. Antennas from 10 to 20 feet available.

PLUS - currently closing out inventory on a popular brand 10 foot TVRO parabolic (and some associated electronics); **we can save you real money** whether foreign or domestic buyer!

SATELCO- 5540 West Pico Blvd.
Los Angeles, CA 90019
[213] 931-6274

Transponder	% / Max. Res.	Transponder	% / Max. Res.
1	6.8%	13	37.8%
2	9.0%	14	41.2%
3	11.4%	15	44.6%
4	13.6%	16	48.2%
5	16.0%	17	52.0%
6	18.4%	18	56.0%
7	21.0%	19	60.0%
8	23.4%	20	64.2%
9	26.2%	21	68.6%
10	28.8%	22	73.2%
11	31.8%	23	77.6%
12	34.8%	13	82.4%

9)The references to a -1.25 volts'' on pages 25 and 26 should be changed to a -5.5 V, and the references to U5 and CR2 deleted. Delete the reference to the adjustment on R30 on page 27.

Remote Control A3

1)**Change** R4 and R6 to 680 ohm, same type
2)**Change** R12, 14 aND R20 to 1.0K, same type
3)**Change** R24 to 1.3K, same type
4)**Change** R26 to 120K, same type
5)**Change** R25 to 50K pot, Bournes 3386F-1-503 (et al)

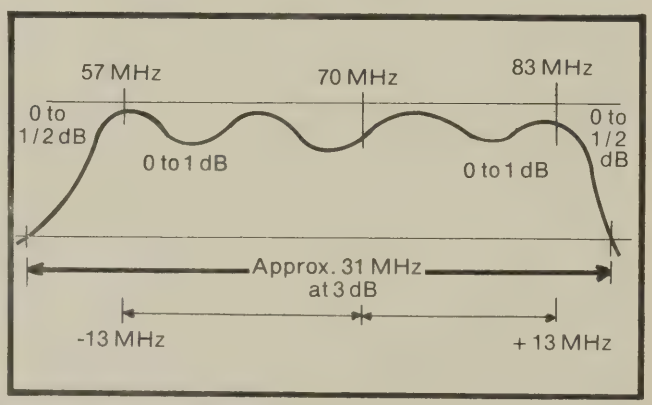
Down Converter A1A1

The 70 MHz IF filter has been revised **to reduce the slope** across the passband making it less susceptible to response changes from imperfect VSWR on the 50 ohm line to the demodulator console when U9 is not used. The specific changes are:

1)**Change** C10 to 27 pF (Sprague 10TCC-Q27)
2)**Change** C11 to 30 pF (Sprague 10TCC-Q30)
3)**Change** C13 to 18 pF (same as C17)
4)**Change** C14 to 56 pF (Sprague 10TCC-Q56)

Further experimentation suggests that the best method of **tuning the 70 MHz IF filter** is as follows (change page 15, steps 1 through 9):

1)**Tune L3** for a **notch** at 47.5 MHz and **L5** for a **notch** at 92.5 MHz
2)**Tune L2,L4,L6** for **a max** at 70 MHz
3)**Tune L3** for a **max** at 57 MHz and L5 for a max at 83 MHz
4)**Repeat** steps 2 and 3
5)**Repeat** step 2, **then tune L4** small amounts in either direction while retuning L6 to establish a passband shape with two outer and two inner peaks. The primary effect of L2 is to change the size and centering of the inner peaks.
6)**Repeat step 5** until a passband as shown here is obtained. The objective is to obtain the flattest possible response over the region occupied by the peak-to-peak carrier deviation (+/-13 MHz).



Ramsey Electronics advises that W-J is now supplying U6 (**890** MHz VTO; correct schematic figure 7) to them as a special order item; part number V705R. No component changes are required. Large quantities of the Hewlett Packard mixer (U5) continue to be available at this writing so the PC board changes per 'Errata #1' (see inside back cover of manual) utilizing the Mini-Circuits TFM-2 are necessary only if you choose to use that mixer.

Recent Amphenol connectors (part number 32650) used for J5 and marked 74868 UG-1095A/U require a different adapter bushing when used with 0.141 hardline. The parts required are a #6 thru-hole (0.148) x 1/4'' diameter x 3/16'' long solderable spacer (H.H. Smith 8704) and a #6 flat washer 3/8'' or 9/32'' OD (change the parts list). Change steps 1) and 2) on page 14 to read as follows:

1)**Sweat** (solder) the spacer to the hardline leaving 5/16'' hardline projecting beyond the spacer.
2)**Cut through** the outer-jacket (only) of the hardline, flush with the front of the spacer (a jeweler's saw or mini-hack-saw is the best tool) and peel or twist off the jacket to expose the Teflon insulation. Cut through the Teflon insulation to the center conductor 0.13 inches from the face of the spacer. Remove the portion cut free and install the center pin butted-up-tight to the center insulation. The flat washer and then the connector nut may now be slid over the hardline from the **opposite end** to complete assembly of the connector.

Sound IF A2A1A2/A3

The winding instructions for L5 have been changed slightly **to center the slug tuning range.** Change the turns count shown on page 37 of the manual as follows:

L5-1....57-1/2 turns
L5-2....55-1/2 turns
L5-3....50-1/2 turns
L5-4....97-1/2 turns
L5-6....85-1/2 turns

Miscellaneous

Some kit builders have apparently been told by various parts distributors that both the Alliance rotor motor and the Plessey SL1613C are no longer available; both statements are incorrect.

Alliance has assured the authorized distributor for the kit, Ramsey Electronics, that although the C225A rotor is no longer a distributor item, the **replacement motor** will **be offered indefinitely** (which only makes good sense since all of their motors differ only in the type of position feedback device used).

The Plessey regional sales office reports that while the 1613 has not been a hot seller (before this receiver!) it is available and shares the same 'die' as their 613 device (metal can) which Plessey intends to keep in the product line indefinitely. Ramsey reports they have not had any availability problems with the 1613.

ONGOING WASHBURN ERRATA

While some of the 'errata-changes' appearing in CSD over the past three months for the February-released Washburn TVRO Receiver Manual are corrections **to the original text and drawings, a high percentage of the data is Clyde's desire to keep potential builders of this receiver** up to date **in later parts availability changes and newer techniques for improving the basic receiver. CSD thanks Washburn for staying 'on top' of the project and seeing to it that through CSD there is a constant flow of new information relating to this innovative receiver.**

DOWN ONCE AGAIN
$695 KIT/$995 W-T
TVRO RECEIVER

The manufacturer (**SAT-TEC** at Box 10101, Rochester, NY 14610; 716-381-7265) describes their receiver as a 'cheapy radio'. In technical talk, that means it is inexpensive. The big news here is not so much how they do it, but what they do. So we'll give you that first.

1)**Wired and tested** - ready to plug in and operate - **$995.00**
2)**A kit**, everything here including case, power supply -

$695.00

3) Wired and tested circuit boards (a pair as we shall see) - $695.00

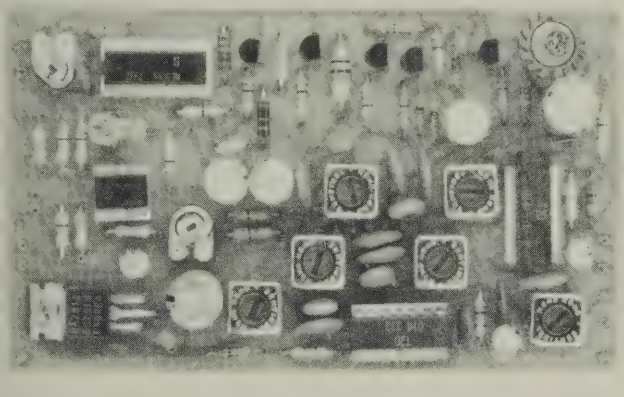
What is it? A 3.7 to 4.2 GHz satellite video receiver with such features as:

a) Double conversion (the first conversion is from the input 3.7 to 4.2 range down to 1100 MHz; second conversion is to 70 MHz);
b) PLL demodulator (Signetics 564 'selected');
c) Dual sound sub-carrier (6.2 and 6.8 is standard) selection;
d) AFC circuitry (+ / - 5 MHz locking range);
e) Video (1 volt P-to-P) and audio (1 volt) to drive either an external RF modulator (they have model BC-1 RF modulator available as a kit only for $25) or loop through a VTR to use that modulator.

The SAT-TEC 1 receiver is on a pair of circuit boards. On the DC-1 board is the 1100 MHz IF amplifier and filter, 1170 MHz LO (high side injection), first VCO (a quality Watkins-Johnson V802 unit), first mixer (Vari-L DBM 500), second mixer and second LO and a 70 MHz amplifier and filter. Level out of this board, at 70 MHz, is -20 dBm. This board, which gets you from 3.7/4.2 down to 70 MHz, has 60 dB of gain and operates from a single 20 VDC line (at 200 mA). Can you buy this board alone? Yes...contact SAT-TEC for details.

SAT-TEC downconverter board [DC-1] converts 3.7-4.2 GHz down to 70 MHz IF after passing through high IF of 1100 MHz.

The second circuit board is their demodulator board. It takes in the 70 MHz IF signal and produces 1 volt P-T-P video and 1 volt of audio. There are a pair of audio demods in the unit and you can order them (or set them up) on any of the popular audio sub-carrier frequencies (6.2 and 6.8 are of course the most comon). This board has a PLL demod (NE564 'selected' for good performance at 70 MHz), video processor (CCIR de-emphasis, 4 MHz low pass filtering and 30 MHz clamp), and AFC circuitry (the AFC has a lock range of greater than 5 MHz). Powering is via a 20 VDC line at 200 mA.



D-1 DEMODULATOR board completes the system transforming 70 MHz IF signal to baseband video and audio [two sub-carriers].

The wired and tested package is in an enclosure with a tuneable calibrated knob (for transponders). Note that you have to have an external modulator of some sort as the output is baseband.

EARTH STATION EQUIPMENT

10 FOOT FIBERGLASS REFLECTOR

Includes feed mount and polarization rotator plus full plans for polar mount. **$875**

LOW NOISE AMPLIFIER

AVANTEK AWC-4205 120K, 50 dB gain, DC Power. Power supplied via R.F. Cable. D.C. Block included **$1099**

Also: Feeds, Power Splitters, Receivers, Distribution Amplifiers, Complete Systems Packages.

WE CAN DELIVER QUICKLY

Discounts available on package and quantity.

TRISTAR GENERAL, INC.

4810 Van Epps Road
Cleveland, Ohio 44131
Phone: (216) 459-8535

3.7 - 4.2 GHZ SUPERVERTER

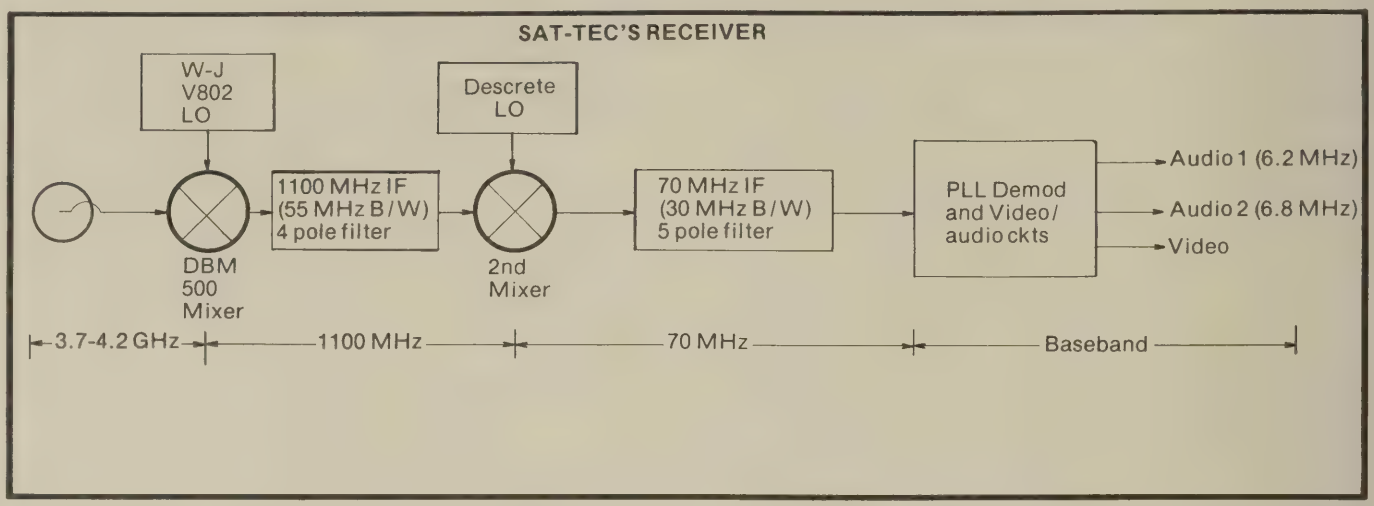
70 MHZ IF 30 MHZ Bandwidth 25 dB Gain 10 dB Noise Fig. 10 dB IMAGE Rejection (Min.) Mount at Antenna, SMA Input "F" Output (75 ohm), Wired & Tested, Less Power Supply

$400.00

GHZ Engineering, P. O. Box 33205
Phoenix, AZ 85067 - 602-266-9749

SAT-TEC was present at the Miami SPTS with both their basic kit information and circuit boards and parts. Subsequent to the Miami show they have contracted to supply a large quantity of the boards (wired and tested) to a Canadian firm that will be introducing the system re-packaged for Canadian sale. Delivery at the moment is from O-T-S (off the shelf) to 3 weeks depending upon how you hit their production schedule.

A few words of observation about the receiver offered. The design looks solid and certainly the selection of the Watkins-Johnson VCO and the Vari-L DBM-500 high mixer suggest that no corners have been cut in the SHF portion of the radio. The world of demodulators has come a long ways in the past few months and with better demod circuits and some relatively sizeable production runs costs are coming down



rapidly here as well. IF gain (at both 70 and 1100 MHz) in this receiver is with the new but very popular MWA series devices and older but suitable devices such as the Amperex ATF-417 25 dB gain hybrid amplifier unit.

SAT-TEC is taking advante of large quantity parts buys by employing parts in this receiver which are also being utilized in other affiliated company products. We think there is a message here for anyone thinking about building receive system hardware for low cost (as in private) TVRO use. With the impact of such buying procedures the pricing on satellite video reaceivers may be headed down faster and deeper than we anticipated even a few short months ago. For the moment at least, these new kits and W/T units would appear to be the lowest priced systems available to the marketplace.

MORE DATA ON LNA PROGRESS

If you have been worrying about not having the 'proper' test equipment to work with building your own lower-cost LNAs here is a system worked out by Ken Rae which should be very appealing. The purpose of this particular system is to check the alignment of one or more stages of LNA (multiple stages tend to be more difficult to properly align due to coupling mis-matches between stages) so that they are flat across the full 3.7 to 4.2 GHz band. Most of the equipment required will be found in your LNA plus receiver package; the only additional equipment required is:

1)Oscilloscope (wideband units to 100 MHz are nice but not required)
2)Saw tooth generator at 5 CPS (can be the horizontal output from the oscilloscope sweep)
3)a 12 watt, 18'' florescent lamp bulb and associated ballest if required.

See figure one. Rae places the lamp directly in front of the feedhorn attached to the LNA. This can be done with the whole assembly sitting on your test bench. The florescent lamp is (believe it or not!) a very linear noise source at 4 GHz (some incandescent lamps will work just as well). The lamp puts out a linear white noise burst with respect to the 60 cycle AC, well up into the GHz range. The 5 CPS sawtooth couples back into the system through the LO (effectively modulating it). The IF amp (in the 70 MHz range) amplifies the signal from the florescent lamp noise source (along with the LNA) and by tuning the LO through the range you can look at the full 500 MHz spectrum of the LNA. The output of the IF at 70 MHz requires a scope good into this range if you intend to **directly detect** the energy present in the 70 (typically 55 to 85) MHz range.

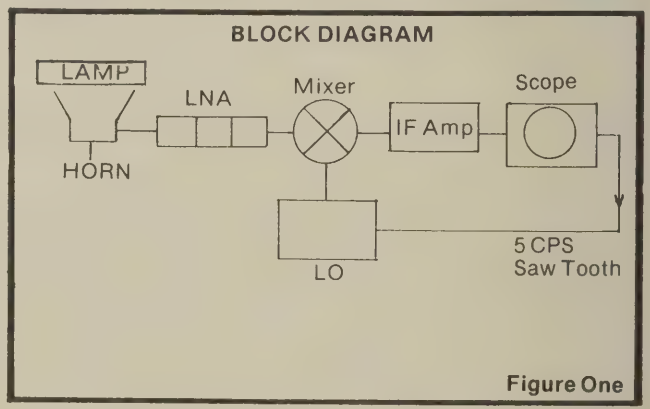


Figure One

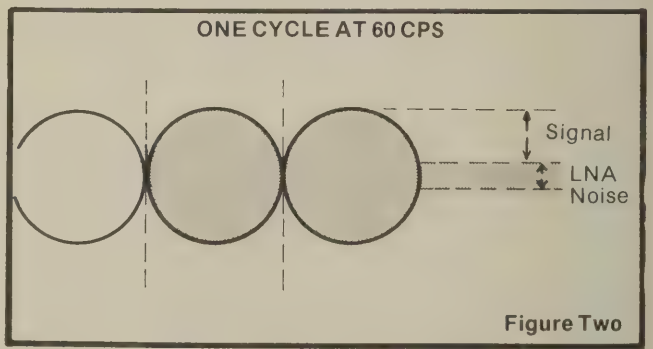


Figure Two

Prepared from material submitted by:
Kenneth D. Rae
737 South Clarkson
Denver, CO 80209

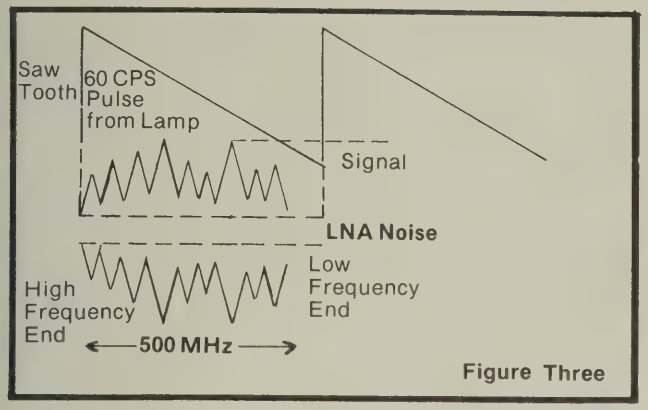


Figure Three

Rae reports this sytem performs very well with IF gain in the 50 dB region and even with single stages of LNA gain (although multiple stages provide more voltage gain and therefore greater display sensitivity or height).

Figure two shows what you will see with each cycle at 60 CPS. The LNA noise is 'buried' by the noise of the florescent lamp white noise broadband source.

Figure three shows a display that indicates the LNA has poor bandwidth. All 'signal' tips should have the **same** amplitude or height on the display.

Figure four shows the same display with the florescent lamp switched off; here you need sufficient system/scope sensitivity to see the noise 'pattern' or 'floor' of the early LNA stage(s).

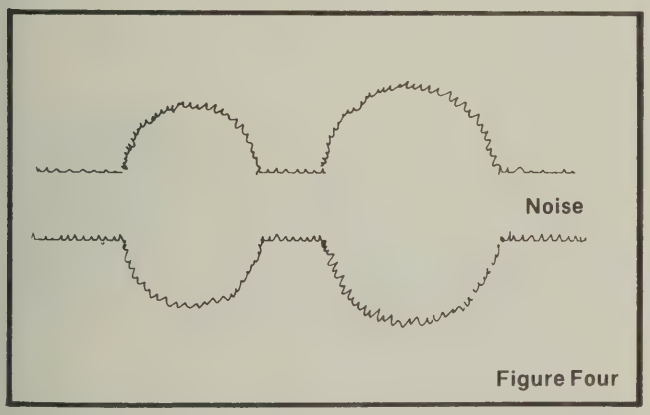


Figure Four

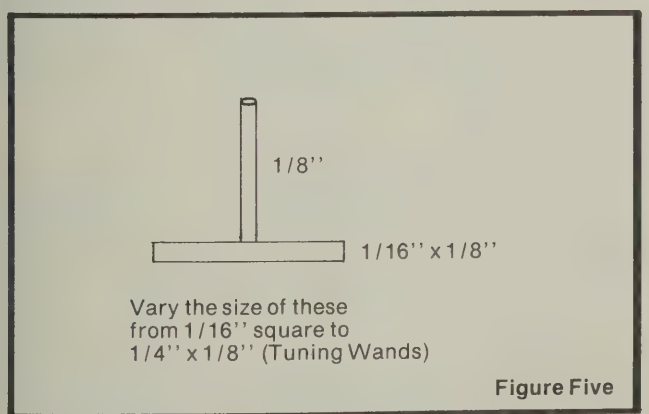
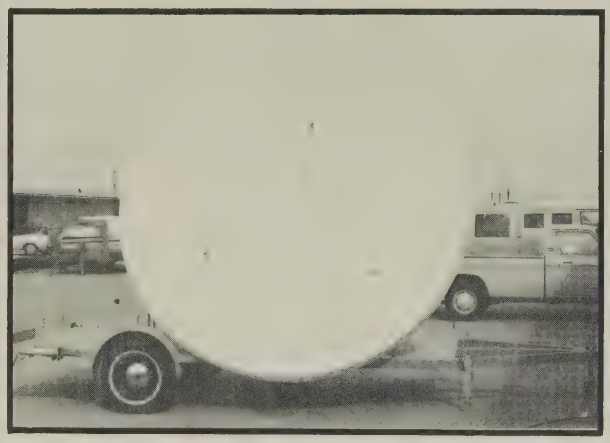


Figure Five

Rae suggests that while most LNA circuit board layouts employ fixed inductances (i.e. printed onto the boards and not adjustable) that individual amplifier stages can often be improved by 'reloading' the 'L' of the circuits with various experimental 'wands'. A wand is made up for test purposes by

HIT THE ROAD!



Hit the road with the leader; H & R's STARVIEW System. Nearly 100 systems shipped since Miami's SPTS; our dealers and distributors are on the road TODAY demonstrating and selling private TVRO systems!

STARVIEW BASIC DELIGHT

Complete 10' trailer mounted transportable system with top-quality commercial equipment, including:

- 10 foot STARVIEW parabolic equipped with rotateable feedhorn system
- Avantek 120°K LNA
- Microdyne 24 channel Receiver
- 75' of hookup cable and connectors

With this system you can pull up to a demo site and be showing off pictures in 30 minutes time! **The price?** $7200!

STARVIEW DEALER SPECIAL

Nobody can beat this package for high performance and low price! Included for $3995 are the following:

- 10 foot STARVIEW parabolic with feed horn
- Avantek 120° K LNA
- International Crystal 24 channel receiver

We also have 13', 16' and 20' antennas, and, systems and the experience to design and ship your system 'off-shore' to non-US locations. PLUS - we stock and sell LNAs, receivers, feedhorns and cable/connectors!

HIT the road with the 'Hit-Of-The-Road'; a STARVIEW system from H&R. YES - a limited number of dealerships are still available!

HIT THE ROAD!

H & R Communications
STARVIEW SYTEMS
Route 3, Box 103G
Pocahontas, Ark. 72455
(501-647-2001)

cutting various pieces of metal (Rae says he uses flat-rolled tin cans although brass or sheet copper would also work just as well) into various sizes such as from 1/16th inch square up to 1/4 x 1/8 inch in size. Glue the metal portions onto a short plastic rod (a 'swizzle stick' should work just fine!) as shown in **figure five**. The plastic rod is a 'handle' that allows you to carefully move the metal portions around on the circuit for measurements and tests utilizing the signal source system just described. The purpose of the tests is to reload the circuits in such a way that you optimize the response of the system as indicated by the scope display.

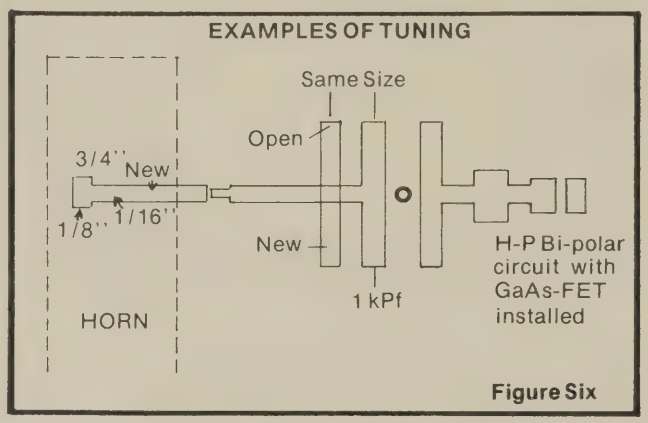


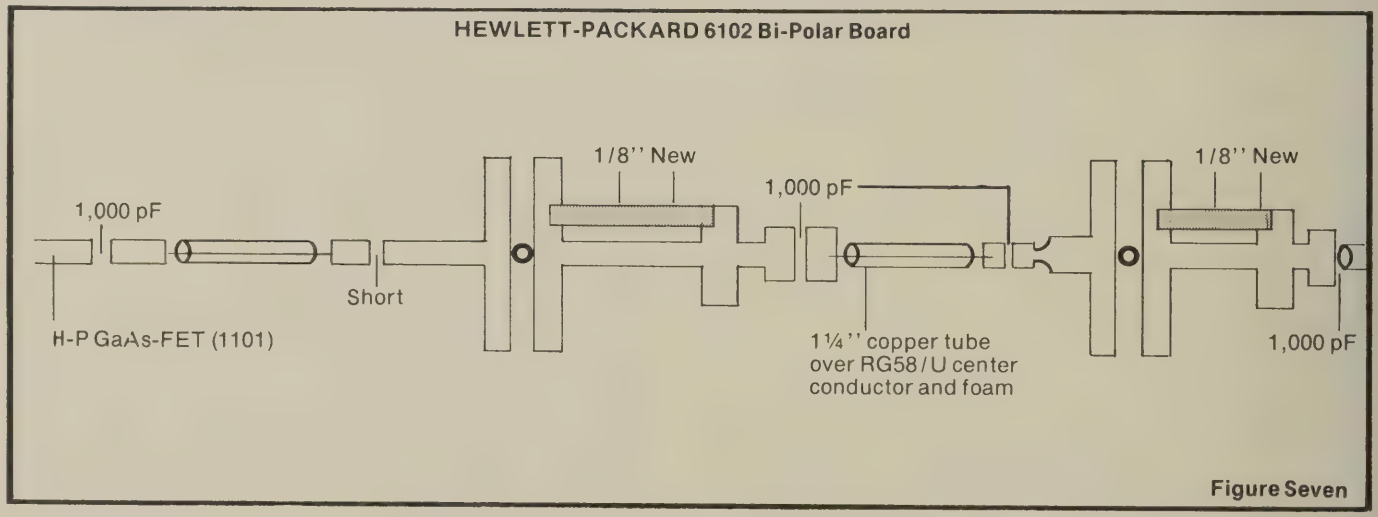
Figure six shows one example of 're-tuning' the popular Hewlett Packard etched circuit intended for the 6101/6102 series of bi-polar transistors. **Figure seven** shows both tuning techniques for an HP 1101 GaAs-FET followed by a 6102 and a method of coupling between stages utilizing a piece of RG-58 cable that has had its outer jacket and braided shield removed, replacing these with a 1-1/4 or 1-1/2 inch length section of copper tube.

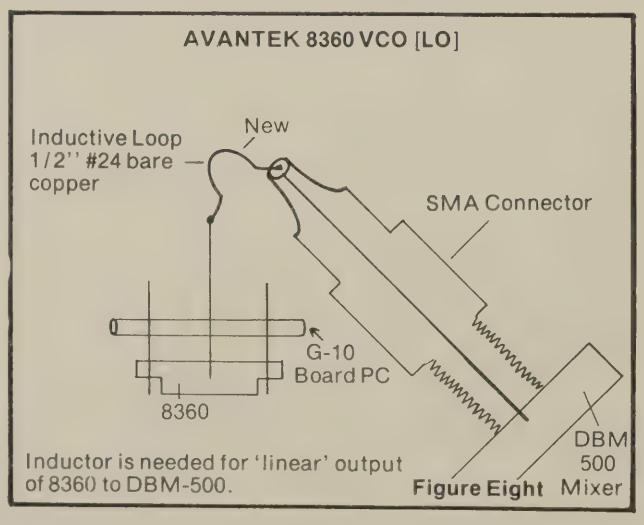
Rae is a true experimenter and he has found that in any LNA circuit he has built the 'Wand' can be employed throughout the circuit to check and often improve the performance (i.e. flatness) of the circuit. You can see the changes made by the scope display and these tell you which way to go with your final configuration of the LNA etched inductor layout. The system in effect allows you to 'measure' (after a sort) where changes are required to optimize all sorts of things including a) strip line length or width, b) stage to stage coupling, c) local oscillator coupling, d) horn probe length, and e) even bias on LNAs.

There is one warning. Tuning wands, moved about on the board, can cause the LNA to oscillate with excessive current. Keep a sharp eye on the bias meters while tuning and be prepared to shut down at the first sign of excessive current on your device.

Finally this note from Rae. See **figure eight**. He suggests that if you want to maintain a linear output from an Avantek 8360 LO source that is coupling into a DBM500 balanced mixed, you need to add an inductive loop made up from 1/2'' of #24 bare wire as shown in the drawing.

For those with Ham radio capability, Rae is an amateur (WBOPOP) and he checks into the Sunday net at 1800 Z on 14.311 MHz and he will be glad to discuss his experiments with others there.





MITSUBISHI GaAs-FETS

A line of Mitsubishi GaAs-FET devices suitable for do-it-yourself LNAs in the 4 GHz service are now available in small quantities from **Applied Invention** (RD2, Rt 21, Hillsdale, N.Y. 12529). For 3.7 to 4.2 GHz service there are three devices of interest:

a) **MGF1401** which has a typical noise figure spec of **1.5 dB** (120° K) and typical gain of 10.5 dB per stage;
b) **MGF1402** which has a typical noise figure of **1.1 dB** with 13 dB of gain;
c) **MGF1412** with a typical noise figure of **0.8 dB** (68 degrees K!) and gain of 13 dB.

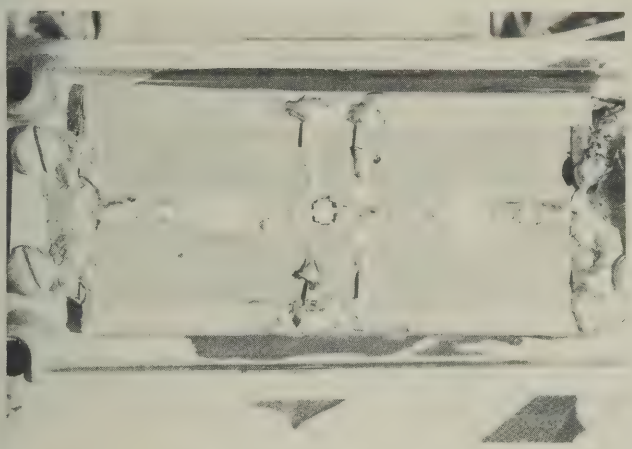
A fourth unit which might make a good 'post amplifier' for 3.7 to 4.2 GHz signals is the **MGF1400** which has a **2.0 dB** noise figure and 9 dB of per-stage gain.

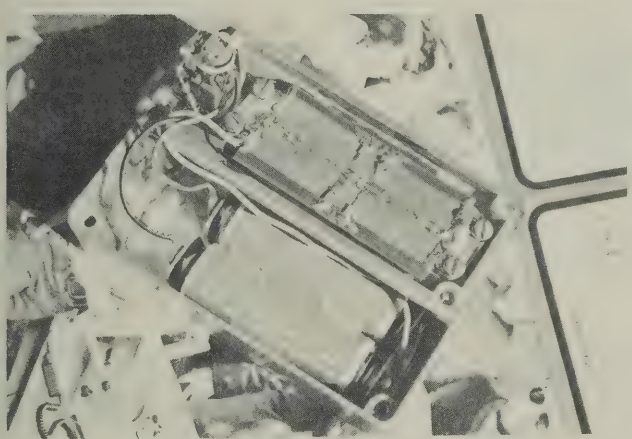
With each device ordered Applied Invention supplies a full set of Mitsubishi data sheets. Pricing on the devices in 1 to 9 quantities within the continental USA is as follows:

a) MGF1400 $24.50
b) MGF1401 $28.30
c) MGF1402 $50.00
d) MGF1412 $75.00

That suggests you could put together an LNA with 30 dB of gain and a noise temperture (after input and coupling losses) of around 100° K for perhaps $127.80 in devices (MGF 1412 + 1401 + 1400); or a high quality 120 degree unit for $102.80 in devices (MGF 1402 + 1401 + 1400). Terms are payment with order, company check or money order.

One enthusiast who has already put the Mitsubishi devices to work is **Bob Luly** (449 S. Sierra Way, San Bernadino, CA 92408). Luly's handiwork is shown here; a 'post amplifier' for producing around 10 dB of gain across the 3.7 to 4.2 band (after, at the tag end of an LNA, on the test bench or to boost the signal after a particularly long run of coax line).





Note that Bob's single stage device fits into a stock self-sealing container and the whole circuit fits up against the bottom side of the top piece. Powering is simply thr[illegible]a pair of 4.2 volt batteries. There are four chip capac[illegible]s in the now-familiar input/output lines and two more tha[illegible] couple into and out of the stage. Bob will probably have this unit plus other clever 4 GHz gear stuffed into his back pocket at SPTS '80/California; look for him, he's a clever chap!

4 GHz COAX RELAY

Dow Key (P. O. Box 4422, Santa Barbara, CA 93103; Bob Dysart at 805-684-4560) has a new coaxial relay that may be of interest to those people looking for ways to switch 3.7 to 4.2 GHz RF without losing a bunch of signal in the process. Their new 401-230832 model is a single-pole, double throw relay with greater than 60 dB of isolation, an insertion loss of 0.2 dB (not to be used ahead of an LNA!) and it operates from 28 VDC. Pricing is around $140.

SATELLITE TV RECEPTION MADE EASIER!

For those who are working with the Coleman or Howard TVRO system Manuals, here is a selection of PC boards, kits or assembled units which will get you 'up' and 'on-the-air' much sooner!

The following boards piggy-back to our LNA amplifier and active mixer boards to provide you with regulated powering for the important low noise amplifier stage(s):

Model	PC Board Only	Kit	Wired/Tested
MBB (Mixer bias board)	$3.00	$10.00	$20.00
SDAB-HF	$4.00	$20.00	$30.00

To recover satellite audio there are a pair of systems designed to provide 4.5 to 8 MHz tuning for sub-carriers. When ordering kit and tested, specify sub-carrier frequency. All boards edge mount for easy 'stacking'/switching.

Model	PC Board Only	Kit	Wired/Tested
SAA-2	$3.00	$15.00	$25.00

If you are fighting the battle of [illegible]uitable 70 MHz IF system **with** a built-in [illegible]er modulator **plus** channel 3 RF remodulator, here's [illegible] answer! [illegible]ld audio, order one or more SAA boards.

Model	PC Board Only	Kit	Wired/Tested
70HIF	$10.00	$150.00	$300.00

All boards are supplied with complete data for construction. AND - call or write us about our NEW TVRO receiver!

For more information, contact:

ROHNER MACHINE WORKS
John P. Rohner/7th & Elm Streets
W. Liberty, Iowa 52776
(319-627-4212)

THIS PRODUCT NO LONGER AVAILABLE

LOW NOISE AMPLIFIERS
MAJOR BRANDS-Low Prices-Write!

3.7 — 4.2 GHz DOWNCONVERTER

[illegible]z in, 70 MHz out
[illegible]control tuning
[illegible]-stable
[illegible]ted $895.

Pol[illegible] Feed Rotation
[illegible]ish
[illegible]paid

- Teflon PC Boar[illegible] /32''x9''x4'' $14.00
- Chip capacitor kit 1.[illegible] 220, 470 pf...only $18.00
- SMA and Type N conne[illegible]
- .141'' Semi-rigid coax $3.[illegible]
- 2''x14'' copper tube for Birkill feed. $12.00

THIS PRODUCT NO LONGER AVAILABLE

SATELLITE INNOVATIONS
P. O. Box 5673, Winston Salem, NC 27103

Add $2.00 shipping and handling.

NOISE TEMP vs DEGREES K

Adjusting to the microwave world of measurement is difficult enough without the hassle involved in adapting to a whole new system of noise temperature measurements. To those who come into the 4 GHz world from the relatively safe regions below 1 GHz the non-use of "dB" for expressions of system noise figure is unnerving. Here is a chart which may prove helpful in converting noise temperature in degrees K to the oft-more-familiar dB (of noise).

T° K	=	NF dB	T° K	=	NF dB
10		0.148	105		1.346
15		0.220	110		1.401
20		0.291	115		1.455
25		0.360	**120**		**1.508**
30		0.429	130		1.613
35		0.496	140		1.716
40		0.563	**150**		**1.816**
45		0.625	160		1.913
50		0.693	**170**		**2.009**
55		0.757	180		2.103
60		0.819	190		2.194
65		0.881	200		2.284
70		0.942	210		2.372
75		**1.002**	**220**		**2.458**
80		1.061	230		2.543
85		1.120	240		2.626
90		1.177	250		2.707
95		1.234	**300**		**3.092**
100		1.291			

REF VTR EE MODE

I read the letter from carlton Sawer of page T-15 of the April issue regarding the use of a modulator in the (home) VCR. As far as the RCA VHS machines are concerned his information is faulty. On all RCA VCRs the video is **not** converted before the (video) output.

TECHNICAL CORRESPONDENCE AND NOTES

As shown on the diagram (page 3-15) of the technical manual for the VCT-400 VCR, the video is passed through a 5.8 MHz low pass filter, thru an AGC amp to level it, thru a switching network and then out to the video output jack (and to the RF converter). It has been my experience that whatever degradation there may be when you remodulate through the VCR is due to the narrow bandpass filters **in the RF modulator module**, and, because of the modulator's differential phase response which leaves something to be desired in professional circles.

I do not know if the BETA machines process the video in the same manner, but the Panasonic 9000 series U-Matic operate the same as the VHS machines do. And since the RCA table model VCRs are manufactured by Matsushita this information also applies to those 'branded' by GE, Magnavox, Sylvania, Curtis Mathes, Philco and Panasonic since they are also by Matsushita.

SPTS '80 CALIFORNIA

(M)ARK YOUR CALENDAR / July 4, 5, 6 - 1980

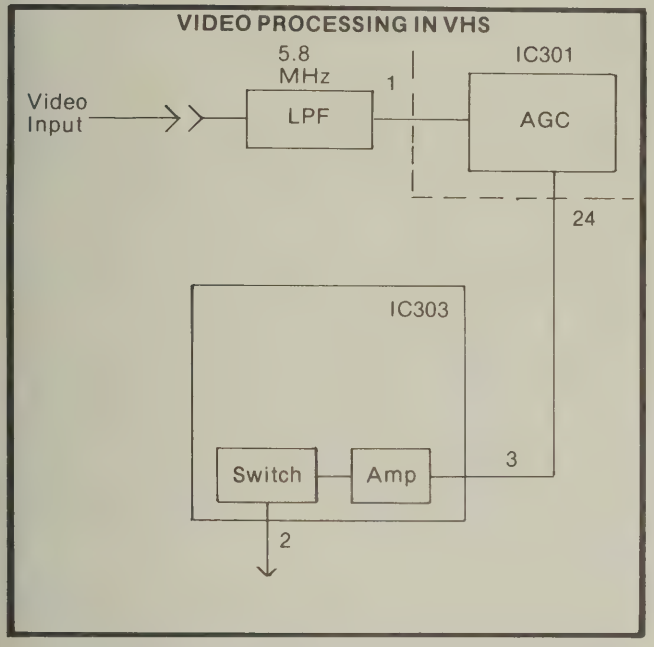
(B)E THERE / San Jose, California

THE SATELLITE EVENT of the decade! A full house of 1,000 are anticipated to attend more than 25 seminar-lecture sessions, see dozens of operating terminals, displays and exhibits, and to have access to nearly 50 hours of satellite-related video through the San Jose Hyatt House MATV system (two channels of satellite information operating simultaneously into 500 separate rooms!). Attend the sessions live, videotape those or others you missed later in the comfort of your own room. **Find out all about SPACE** - the new private terminal industry international trade association. See all of the latest antennas (do it yourself kits for as low as $475!), receivers (kits for as low as $695!) and LNA circuits. **This SPTS** is destined to be the **BIG jumping off point** from which hundreds of new dealers and distributors in the satellite hardware field will begin their new businesses and begin serious marketing of low-cost satellite TV hardware systems worldwide! Use the registration card between T and P sections of this issue of **CSD**; or call SPTS '80 between 9 AM and 4 PM (CDST) weekdays at the number below.

STT SPTS '80 California
P. O. Box G
Arcadia, OK 73007 [405]396-2574

It may not be cost effective but the RF modulator is available as a replacement item from RCA distributors; it is part number 144897 and dealer net/wholesale is currently $70.80. As Distributor Service Manager for RCA in this area I would be happy to help anyone who needs assistance. Keep up the good work with **CSD!**

William Bowen
ADI Appliances, Inc.
P. O. Box 954
Toledo, OH 43695



Several knowledgeable people wrote on this matter. The bottom line, as Clyde Washburn wrote, is that the signal is not converted in the EE mode. The purpose of the EE mode is to allow the user to view the picture he is preparing to record. In the 'around the horn' flow shown in the diagram filter FL301 removes any high frequency components from the incoming composite video signal. The AGC amplifier insures that the signal routed further on is a reasonably constant 1 volt peak-to-peak signal. From here the baseband signal is applied to the video-play processing chip which buffer-amplifies the video signal to 2 volts peak to peak [which amounts to a volt p-t-p when terminated].

MORE PCM-200 DATA

The plug-in receptacle for the RCA PM-200 MAA001A module consists of two halves; RCA part numbers 135450 and 135451. These are available from RCA distributors for about $1 each. Plug-in beats wire-in especially if you want to change pre-tuned modules for different sub-carrier frequencies.

For the sound output modules, number MAN002A, one connector is needed; RCA part number 133634 and also about $1.

SAMS PHOTOFACT Set number 1300, folder 2, covers the RCA XL-100 CTC-48 television receiver which has these modules but it has two omissions; they left out the chassis connectors listed above and blow up photograph of the MAN002A output module. As for the alignment procedure, it consists of but four lines and no test equipment is called for. The procedure described in the December **CSD**, page T12, covers alignment better than this Photofact! Also, the parts listing for the 'orange drop capacitors' in their external circuitry is wrong; calling for Sprague 600 volt (6PS) instead of the smaller 100 volt (1PS) which are obviously adequate. I suggest users of the PM-200 module for sub-carrier audio detection, per **CSD**, save their $6.50 for the SAMS and apply it towards a second sound discriminator board! Finally, speaking of money, rebuilt modules may be obtained from PTS Electronics (some 43 U.S. locations, they advertise in **Radio Electronics** and elsewhere). I paid $13.50 for each module with no 'dud' to exchange.

Stan Jeffcoat
612 S. 10th Street
Yukon, OK 73099

Well done, Stan. Certainly the PM-200 module described in a couple of issues of CSD this past fall has become a mainstay of inexpensive audio sub-carrier recovery.

WANTS TO START SOMETHING

I would like to start some type of local organization here in the Austin, Texas area for people who are working or building or thinking about building a home TVRO system. Perhaps we could get together once a month or so to exchange information and ideas.

John W. Walden, Jr.
203 Soloma Circle
Austin, TX 78626 (512-863-8852)

This is an idea who's time has come. Anyone who wants to start a local or regional group drop us a note (attention Coop). **We'll run a list of those looking to get groups started and then after they get established list when and where they meet and who to contact. If there is sufficient interest, STT will even make available at a very nominal rental rate our videotape library to use for creating special programs for local meetings. We'll provide the publicity and program material; you'll get together, you hear!**

GENUINE HOWARD TERMINAL PC CARDS

Bob Coleman and Tay Howard are now producing six PC cards which make duplication of the Howard Terminal (latest version) a snap!

(A)Dual Conversion (4 GHz to 70 MHz) - $25.00
(B)70 MHz IF and Filter - $25.00
(C)Howard Demodulator - $40.00
(D)Dual (2 channel) Audio - $25.00
(E)Single Channel Audio - $15.00
(F)AFC and Metering - $15.00

These field proven and tested high quality boards are available as a five-board-package for $99 package price (you receive A,B,C,E and F above). Included is complete documentation for construction and a list of parts stocking distributors.

Order from: Robert M. Coleman, Rte. 3, Box 58-A
Travelers Rest, S.C. 29690

SLOW - TVRO System Delivery ?

ANXIOUS to get your earth station up and running? Tired of getting the run around on receiver and LNA delivery? Check with AVCOM!

AVCOM's field proven PSR-3 receiver is in full production. With remote tuning, dual video outputs, our exclusive Clamp-Sync and Scan-Tune, the PSR-3 is the finest TVRO receiver on the market. Combine this high-quality receiver with our in-house-stock of high quality 120°K (50 dB) LNAs and you have the best private terminal package available today. PLUS - **we deliver radios and LNAs**...not promises! YES - AVCOM always has room for one or two more qualified dealers and distributors.

AVCOM of Virginia, Inc. (804)320-4439
10139 Apache Road, Richmond, VA 23235

TECHNICAL NEWS NOTES

HIGHLY SUCCESSFUL first tests of new Microwave Associates 4.6 meter transportable video (audio, data, etc.) UPLINK terminal took place April 7th at Burlington, MA headquarters of firm. In rain drenched session 700 watt TWT output loading into 15 foot region antenna was tested on WESTAR and SATCOM FII (transponder 22 was used even though RCA says it is a 'sick' transponder) producing 51-52 dB signal to noise ratio video at receive end of dual purpose terminal. Exciting as the tests were the pricing for this transportable system is even more interesting. The full system, ready to plug into a local 220 VAC 3-phase source and provide direct video (plus up to three audio subs) into the bird of your choice is $150,000. Yes, that's not in the hobby class but when compared with other prices for transportable systems, it is starting to get attractive. System includes frequency agile uplink transmitter, 700 watt TWT amp, frequency agile receiver, 4/6 GHz feeds and attendent electronics and mechanics. Exact transport cubic feet required is not available but it appears it would go onto a 10 foot U-Haul trailer with ease, fit airplanes of DC-3 and up size with ease. One clever design approach; to weight-down the terminal on site so that it maintains boresight it uses three 'waterbed' containers that are filled with water at installation time, emptied and rolled up afterwards. The first 'Waterbed Uplink'!

BUDGET CUTS apparently left most of the NASA programs (including Shuttle) in place. Only identified 'loss' was 20/30 GHz narrow band antenna system which NASA wanted funded for design phase. Latest Shuttle data shows first **operational** mission (TDRSS-A) now scheduled for March of 1982 and first INTELSAT V (5) launch in August 1982. Same August '82 launch will also handle Telesat Canada ('C' bird). Publication of schedule also showed INSAT 1-A (India) in December of 1982, Palapa B-1 in March of 1983, Arabsat-A in July of 1983.

PROBLEMS with uplink sites continue to plague NPR; they lost 3 kW HPA early in March, reverted to two-channels of audio with 100 watt output.

BATTLE over last orbit spots available for North American heats up with Southern Pacific Communications asking FCC to select them over Hughes and others desirous of far eastern orbit slots. SPC claims they would launch dual band (4 and 12 GHz) birds "each with equivalent of 48 transponders". SPC attempting to build 'case' for 'maximum efficiency of utilization of orbit slots'. In related battle, RCA and WU both want access to 83 degree west spot. Western Union has proposed that they: [1] place (yet to be launched) WESTAR IV at 99 degrees west, [2] move WESTAR I (at 99 now) to 83 degrees, and then replace I with the first TDRSS advanced WESTAR in 1982, [3] place second TDRSS at 91 degrees when it is launched (June of 1982 according to present Shuttle plans), [4] move WESTAR III (now at 91 degrees) to 123.5 degrees (now occupied by WESTAR II). First **actual** Shuttle launch (note operational launch scheduled March 1982) now set for February 1, 1981.

NASA has proposed 'nationwide communications system via a new (yet to be designed) domestic satellite' which would allow two-way voice communications between non-urban areas, two-way communication in metropolitan areas via integrated terrestrial systems, or interconnection between areas'. System would utilize 800-900 MHz band with massive (139 foot) antenna system parked at 110 degrees west offering perhaps 70 spot beams. NASA envisions system by which a 800 MHz range uplink mobile radio (i.e. vehicular communications) would 'talk' directly to the satellite and receive the downlink back in the 900 MHz range. Proposed user cost range projected is around $25 per month for 'unlimited calls'.

UTILIZING 25% of a single WESTAR transponder new Data Communications Corporation plans to install 202 separate transmit-receive earth terminals in 100 major US cities with base of operations in Memphis. Firm plans to utilize 10 meter antenna at Memphis, 4.6 meter antennas elsewhere for both transmit and receive. System is designed to allow private business telecommunication links, via satellite.

SIMILAR system, SBS, has asked FCC to allow it to change the projected locations of its Ku band satellites. Now requesting SBS-1 at 106 degrees (original location), SBS-2 at 103 degrees (from 122) and SBS-3 at 100 degrees (from 125 west).

MOVIE distribution via satellite is eyed by Francis Ford Coppolla ("Godfather" et al). He has directed his new Hollywood sound-lot to prepare for "all electronic creation and distribution" of feature films "within five years".

NEW YORK TIMES now transmitting via WESTAR II SPC transponder a facsimile of each page in next day's edition of Times to new printing facility near Chicago for reproduction and distribution in 9 state area. Trnasmission begins around 8 PM eastern each day.

SHARED USE of uplink facilities by PBS and commercial interests in New Orleans, Houston and Washington, D.C. to get underway soon. Through sharing commercial TV stations and others may utilize WESTAR I channels for relay of occasional video feeds.

LOW COST method of rotating antenna feed suggested by experimenter Robert Coleman; Bob now uses VW windshield wiper motor with limit switches to accomplish quick, positive switching from V to H and back again for under $10 total cost!

HONEYWELL-Spacekom offering 4.5 dB noise figure 11.7/12.2 GHz downconverter that bolts directly onto LNA to convert an existing 3.7 to 4.2 GHz terminal to a 11.7 to 12.2 terminal. Downconverter must be driven by external PLL or free running oscillator; input to converter is WR-75 waveguide flange. Pricing and delivery unknown; contact them at 214 East Gutierrez Street, Santa Barbara, CA 93101 (805/865-1013).

SAW BANDPASS filters covering 70 MHz IF band for standard TVRO systems announced by Andersen (1280 Blue Hills Av., Bloomfield, CT 06002). Model 70-36000-99 has 1.5 dB insertion loss at +/- 18 MHz points and rejects 30 dB at +/- 24 MHz.

Contributor Jon Spisar (see **CSD** for April, page T2) suggests anyone building up his PLL demodulator might want to experiment with optimizing the voltage on the MC1496. Spisar has found that for maximum linearity the 1496 likes to see between 9 and 11 volts.

RAMSEY MOVES

Reacting to the dramatic upsurge in business with their various frequency counter, DVM and other kits, plus the impact of their kit and wired and tested Washburn receivers, **Ramsey Electronics** has moved to new and considerably larger quarters in the Rochester, New York area. Effective back in April the new address for Ramsey is: Ramsey Electronics, 2575 Baird Rd., Penfield, N.Y. 14526 and their telephone number is 716-586-3950.

END OF RICHARDSON SERIES

For fans of Bob Richardson's 'World Above 10 GHz' which has been appearing in CSD on a regular basis since last November this note; the present series is now completed and the multi-talented Richardson is now back at his first 'love'; creating fascinating new software products for the TRS-80. We enjoyed having Bob with us for the past six issues and salute him for his contributions to the state-of-our-art!

COOP'S COMMENT ON PROGRAMMING

ON THE WAY TO THE FORUM

A funny thing happened recently at the FCC. They asked an outside (and one pre-supposes probably unbiased) expert on telecommunications to give them his views on how (not if) they should create a DBS (Direct Broadcast Satellite) system for the United States.

David Rice, Associate Director of the Communications Media Center in New York, told the Commission they have three options. Significantly, not one of those options was that they **not allow** DBS systems. Let's see what this is all about.

The Commission has been anxious to get something on paper concerning direct broadcasting satellites. They have been under much pressure to show that they were aware that such a system was under development in other nations and they have been on the receiving end of barbs and jabs from such Congressional leaders as Congressman Lionel Van Deerlin of the House Subcommittee on Communications. Van Deerlin is a forward thinking chap who cannot be accused of wanting to hide new technology under a bushel basket. In fact without his support 'small earth receiving terminals' probably would still be languishing in a state of 'not-here-yet'. Van Deerlin, through his own forum of the Committee he chairs, has let the Commission know that he wants to see DBS get its opportunity to develop.

The present Commission is deregulation minded. That is, they have shown time and time again that they lean towards less government regulation and more marketplace competition. That's an important position since past Commissions have leaned the opposite way for a decade or more and with that leaning has come a reluctance to allow something new to develop in fear that something new might rattle the cage of something established. Those who have a piece of something already established naturally will use whatever persuasive powers they may command to lobby against the introduction of something new.

DBS is new. It could rattle every single one of the exising cages. It is not likely to put any of them out of their cages but it is likely to change the shape and perhaps the size of their present cages.

Rice suggests the Commission may not need any new authority from Congress to create DBS. The Congress may not agree and of course that will add an additional year or so to the time frame between conception and delivery of the new service. Here are some of Rice's more salient points:

1) **Rice says** the Commission could license DBS much in the way it now licenses terrestrial broadcasting stations. The primary hang-up he suggests is the 'local service' concept of the present broadcast scheme. Short of 200 separate 'spot beams' (one for each of the present "200 TV Station Markets"), he agrees that the definition of 'local' may have to be stretched abit. He suggests that it could be by simply looking at 'regions' (such as the Great Lakes, or New England) as the 'local service area' of a DBS licensee. In other words, expand the locale of local.

2) **Or**, Rice suggests, DBS service could be fashioned after something akin to the present Common Carrier regulation where the carrier (the transponder operator) is simply a conveyance service having nothing to do with the programming at all. They simply (as they do now) rent 'time' to anyone who wants to 'broadcast'. The problem with this approach, according to Rice, is that it would preclude the FCC from having any recourse over the programmers since they would (under present law) not be answerable to the Commission. Some might suggest that is not a bad idea.

3) **OR**, Rice suggests, the service might be a hybrid of both techniques; making the transponder operator responsible for all programming that passes through his service but perhaps setting a maximum amount of this time that he could program on his own; thereby insuring that non-affiliated groups would have at least access to the broadcasting system if they could pony up the money for the time they wished to use.

Rice concludes that the technology for initiation of such service is here **now**. He also notes that the regulatory environments at both the national and international level seem to be more and more receptive to such a service all of the time. He cites the FCC's action of last October 18th (in deregulating the mandatory receive-only-terminal licensing) as a positive step that has placed the Commission into a posture which Rice believes "could help pave the way..." towards establishing DBS.

And so the Commission now has a chunk of paper which they can hand to Congressmen and others in authority who are asking the question "What is the Commission's policy regarding establishing Direct Broadcast Satellites?". But the study will cut both ways. Opponents of DBS will pick it apart line by line, word by word. They will shred it up and use it to line the bottom of their cages. It may even provide a rallying point for the various cage dwellers who see in DBS a threat to their present operations.

Years (perhaps as many as ten) from now it **will** all be resolved. There will be many more reports and studies and commissions (and **C**ommission with a capital C) in the interim.

COOP'S SATELLITE DIGEST (Programming Section) is published monthly by Robert B. and Susan T. Cooper doing business as Satellite Television Technology (Ltd.), P.O. Box G, Arcadia, OK 73007 (USA); 405-396-2574. **CSD** is not affiliated with any satellite programming distributor, hardware (equipment) manufacturer or distributor nor satellite systems operator. STT sponsors the Satellite Private Terminal Seminars (SPTS) held three times per year and does produce and distribute 'learning' materials and 'how-to-do-it' manuals relating to the development of the low-cost satellite TV receiving system industry. Subscription fee is $50 (US funds) in advance Canada, US, Mexico; $75 (US funds) elsewhere. Copyright 1980 by Robert B. and Susan T. Cooper.

SPACE GROUP FORMS

SPACE VOLUNTEERS

SPACE is asking the membership to 'get involved'. Several interim committees are being formed to deal with the most pressing issues facing the group. Here is a list of those specific areas identified to date:

1)**Legislative/legal research committee**
1)**Regulatory watchdog committee**
3)**Technical advisory committee**

The membership application form also asks new members if they would be willing to volunteer some hours to serve in the new Association's booth at SPTS '80 San Jose and additionally if they would be willing to serve on the Association's Board of Directors. When you send in your membership application, you might attach a letter indicating your areas of interest (if any) in these categories.

SPACE GROUP FORMS

During the **first** Satellite Private Terminal Seminar, held last summer in Oklahoma, several people attending felt there was a need to gather together the pioneers in this field and create a 'self protection association'; a national trade association, as it was suggested, of firms and people interested in seeing that low-cost private satellite receive terminals had the opportunity to grow and develop. Such a group was actually formulated at SPTS '79 but apparently the leadership for the project felt the need was less acute than had been voiced at the Oklahoma meeting as very little came of it subsequently.

The subject came up again at Miami's SPTS and this time it got off the ground. During the final day and the final hours of the Miami Seminar Coop invited several people with what he considered keen insight into the problems facing this new industry to join him on the podium for a series of 'David Frost' kind of discussions. In that group of participants in the last session came Gene Martin of Satellite Television Systems (Star Antenna Company) in Lafayette, Louisiana. Gene told two stories to the group assembled; one about his experiences in Lafayette in bringing into a local municipal auditorium during a 'home show' a blacked out professional boxing match utilizing some clever engineering and lots of luck to bridge the distance to a 100 mile plus VHF TV transmitter over in Texas. And a second story that seemed even closer to home, describing how he and others had joined forces to fight a series of legal manuevers brought against business people in Louisiana by the local Bell Telephone company over the question of individual ownership of the telephone type instruments which each had in his place of business. Gene's position was very simple; anything someone does to upset some other person or firm's established business system is going to draw opposition. Gene asked that those in attendance at SPTS '80 in Miami join with him in creating an international trade association of people and companies interested in seeing private satellite terminals flourish.

Joining Gene in the discussion was Washington communications attorney Richard L. Brown of Brown, Bernstein and Longest. Coop introduced Brown as **the** Washington attorney who had made it possible for the small cable television system operator to survive in a Washington climate where in the early 70's small cable systems, typically owned and operated by small, local business people, were being regulated out of business. Brown pointed out to the group that the development of private earth terminals in many ways was paralleling the develop of the early cable industry. Firms supplying to the field were in the majority small firms specializing in a new product which was untested in the marketplace and unaccepted in the legal framework of American communications law. He went on to note that many of the comments reported by government and opposition forces relating to the development of low cost private earth terminals were 'throw away, headline grabbing statements' untested and untried in either courts of law or the marketplace itself. He suggested that if this young industry was to grow and flourish it had better be prepared to take an agressive stance in its own behalf, and be ready to take an offensive position to battle for its rights.

Well, out of this dialogue (which ran for nearly 45 minutes at the closing session in Miami) has come **SPACE**; an accronym for **S**ociety for **P**rivate **A**nd **C**ommercial **E**arth stations. Now what is SPACE and what is it up to?

SPACE is an international association of users of satellite earth terminals with membership open to users, would-be-users, manufacturers, distributors and dealers in the private satellite receiving terminal receiving terminal area. It has already been incorporated in Washington as a non-profit trade association and formal headquarters are located at the offices of attorney Brown [**SPACE, 1521 O Street NW, Washington, D.C. 20005 [202]387-1856**]. SPACE's initial goals are as follows:

1)**To promote** the interest of the public in satellite communications
2)**To defend** the right of users of this communications technology to co-exist in the communications community
3)**To eliminate misconceptions** about the use of private earth stations in order to eliminate the perception of such uses being a threat to other established services
4)**To establish the rights** of private earth station users to view programs from satellites and to resolve the present questions regarding such use; including, Is permission from programmers (really) required? If so, how is such permission obtained? And, can such permission be withheld (legally) from private users?

GENE MARTIN, appearing at SPTS '80 Miami, urging the attendees to join with him in formulating an international trade association.

SPACE MEMBERSHIP FEES

FULL REGULAR MEMBERSHIP - Open to those individuals (private and commercial) who presently own and operate a satellite receiving terminal. Membership fee and first year dues combined is $100.

SUPPORTER MEMBERSHIP - Open to those individuals or firms with no presently operational terminal but who support the goals and objectives of the association. Membership fee and first year dues combined is $25.

FULL ASSOCIATE MEMBERSHIP - Open to original equipment manufacturers supplying any type of hardware for the low cost satellite terminal industry. Membership fee and first year dues combined is $500.

PARTIAL ASSOCIATE MEMBERSHIP - Open to dealers and distributors in satellite receiving system hardware. Membership fee and first year dues combined is $250.

Society for Private And Commercial Earth Stations

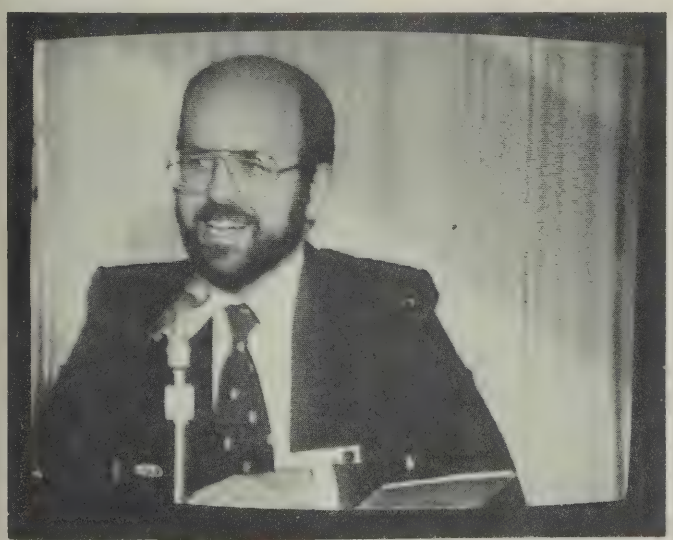
5)**To liason** with the Federal Communications Commission, the Congress, and the White House to insure that the low cost satellite technology has an opportunity to develop without government intrusion.

6)**To determine** what the long term rights of such terminal owners and operators are, and to defend the industry's rights to manufacture and distribute such systems.

7)**To develop** both short term and long term goals and strategies for managing the direction of this new industry.

SPACE has established an initial goal to sign up 1,000 members by the July 4-5-6 SPTS to be held in San Jose. The group will be on the formal 'program' at SPTS and STT has donated to the group an 'exhibit booth' so that they can pursue memberships and explain the objectives and goals of the new industry trade association.

Getting something like this off the ground is a big effort. Just the magnitude of organization is a considerable task. In Brown we believe the group has selected the best possible Washington attorney/liason the group could have. Brown has demonstrated repeatedly that he knows his way around Washington, and that he can be extremely persuasive at the FCC, Capitol Hill and even in the White House. Star's Gene Martin is an equally talented individual with both a good track record and a 200% helping of enthusiasm for the project and the long term future of low cost satellite terminals.



RICHARD L. BROWN, appearing during SPTS '80 Miami, explaining how low cost satellite terminals are perceived as a threat by some present users of the technology.

We read this to be a democratic organization founded on the concepts that it will be governed by the membership through a board of directors which will be strictly accountable to the membership for their activities, their use of funds and so on.

On an interim basis, or until SPTS '80 in San Jose in July, a group of volunteer directors will manage the affairs of the new association. These volunteers largely came forward at Miami and asked that they be included in the planning and organization stage of the association. At San Jose the interim directors will be replaced by a member elected set of directors.

CSD has offered 'space to SPACE' here in 'CSD' so that when they are ready the organization can keep its membership advised of progress, battles and activities on some sort of a regular basis. We anticipate SPACE will begin making use of this 'space' in the next few months. **CSD** has also made available 'space' in the current issue of **CSD** so that readers can join up with SPACE before San Jose. On the insert card found between the two sections of this **CSD** you will find a newly designed 'insert card' which includes a segment for joining SPACE. Note this segment is to be returned directly to SPACE at the address given; not **CSD**/STT.

UPDATE INTERNATIONAL SATELLITES AND LOCATIONS

Information regarding the exact locations and operating modes of the various INTELSAT and other (i.e. Raduga and Ghorizont, etc.) video transmitting satellites is often difficult to locate and harder to verify once found. Some of the satellites are 'in-transit' from time to time; Symphonie and Siro (the ESA and Italian) "experimental" birds are often moved about to conduct different point to point (via satellite relay) experiments and demonstrations. Thus data on them may be accurate one day and inaccurate the next.

Not all of the satellites operate in the familiar 3.7 to 4.2 GHz band; the Russian geostationary satellites for example operate within a band that starts at 3.4 GHz and moves upward into the lower portion of our familiar domestic and INTELSAT range.

With the new interest in receiving international transmissions (see **CSD** for March and April, 1980), including but not limited to INTELSAT, the need is for accurate data that is timely, and while it does exist getting it verified once found is very difficult.

All satellites are pinpointed in space by 'ranging' exercises; two or more ground terminals triangulate on the satellite, their data is fed to a computer with sufficient capacity to solve the orbit determination and then the results spit out. All satellites maintain their in-orbit position within a prescribed 'box' or square in the sky. A typical box is 70 miles east by west, 70 miles north by south and slightly less up and down. With two exceptions along the Clarke orbit belt, all satellites want to move away from where they are assigned. There are two locations in the belt where the earth's gravitational forces are neutral; one near 104 degrees west and another on the opposite side of the world. All satellites located west of 104 west, for example, just naturally want to drift on their own towards 104 west. All east (from around 15 west) want to drift west towards 104. So the satellites are kept on station by the scheduled firing of small thrusters after ranging experiments indicate that the birds have gotten too close to the edge of their respective 'boxes'. SATCOM FI drifts on its own towards the eastern edge of its box, and then when required thrusters nudge it back to the western edge of the box where the drift starts all over again. There are other forces at work on the satellites as well; the satellites attempt to maintain a location directly over the equator but solar eruptions (caused by the current peak of the sun spot cycle), the pull of the moon's gravitational field and other events work to precess the satellite either north or south of the exact point above the equator. On a normal day the satellite is pushed northward above the equatorial line for about half of the day, and then pulled southward for the other half of the day. This travel is small and in fact neither this movement nor the east-west drift can be 'seen' (i.e. measured or detected) by dishes much smaller than 20 foot in diameter; their beamwidths are simply too wide or broad to notice the slight changes in satellite location.

The larger antennas do notice such movements however and for this reason systems designed to work into INTELSAT, for example, where 50 to 100 foot antennas are designed to track (over at least a small distance of several degrees) the extra engineering workload to boresight all terminals associated with a single satellite becomes considerable if the satellite is not stable; in theory it is far more efficient to work extra hard at keeping the satellite itself close to station than to force several dozen or hundred terminals to follow it around the sky.

SELECT YOUR CATV SYSTEM
Satellite Programming
INTELLIGENTLY...

...with **SAT-Guide**

Twenty channels of programming today on FI, soon 35 on FI and D2. Keeping up with what is 'up', when, is almost impossible. Until SAT-Guide.

ALL FI programs on **all** transponders are listed in this unique programming guide to satellites. INCLUDES daily program listings PLUS monthly summaries of movies, sports and specials. Only $28 per year from:

SAT-Guide P. O. Box 1569
Division of Commtek Hailey, ID 83333

PLUS - where as large antennas have a tighter requirement to maintain boresight on the satellite of interest at 4 GHz, the problems becomes approximately 300% more acute at 12 GHz (i.e. ANIK B and INTELSAT V birds now going up) simply because for a given parabolic reflector size the beamwidth narrows to around 1/3rd of the 4 GHz beamwidth at 12 GHz. So station keeping is a continuing task and as the satellite systems move higher and higher into the frequency spectrum the problems associated with station keeping multiply rapidly.

In the April **CSD** we looked at the best reports on hand regarding 4 GHz INTELSAT activities. Overall we found that most INTELSAT birds carry some video, virtually all of which is 1/2 transponder in format, and very little of which is transmitted on a hemispheric beam (and virtually none is transmitted via spot beam). Now let's look at where the 'targets' are for various places in the world.

0 to 75 WEST	
Bird Name	Nominal Location
INTELSAT IV-E	1.0 west
INTELSAT IV-A	2.6 west (1)
SYMPHONIE I	11.6 west
SYMPHONIE II	11.6 west (2)
GHORIZONT 2	14.2 west
INTELSAT IV-B	18.5 west
FLEETSATCOM 2	**23.7 west** (3)
INTELSAT IV-AA	24.6 west
INTELSAT IV-AB	27.5 west
INTELSAT IV-AC	34.5 west
SMS-1	**66.7 west** (3)
ATS-5	**70.0 west** (3,4)
LES-6	**74.4 west** (3)

And the footnotes. [1] - INTELSAT IV-A was at 5.01 degrees west back in September. This is an old bird, its usefulness at the present time is unknown, and it may be simply reserving a parking spot. [2] - Symphonie II was located at 11.65 west in October, later was moved to 161.29 degrees in November according to some data. Symphonie I should still be located at 11.6 degrees west in any event. [3] - These birds (bold faced) are **not** operational in the 3.7 to 4.2 downlink band. [4] - ATS-5 was located between 5.0 and 5.5 degrees **south** of the equator rather than directly above the equator.

76 to 165 WEST	
COMSTAR III	86.9 west
RADUGA 4	**87.1 west** (5)
COMSTAR II	95.0 west
WESTAR I	99.0 west
FLEETSATCOM 1	**99.5 west** (6)
ANIK I	103.9 west
ATS-3	105.2 west (6,7)
ANIK II	106.5 west (8)
ANIK-B	108.9 west
ANIK III	113.9 west
SATCOM II	118.9 west
SIRIO I	121.8 west (9)
WESTAR II	123.4 west
COMSTAR I	127.8 west
SATCOM I	134.9 west
CTS-I	**141.7 west** (6,10)
ATS-1	**149.4 west** (6,11)
SYMPHONIE II	161.3 west (12)

And the footnotes. [5] - This is the 'mysterious' Russian craft that is being maintained 'on station' from either Cuba or Russian ships at sea (the USSR cannot 'see' this Clarke orbit spot directly). This class of satellite is **equipped** to transmit down within the range 3420 to 3820 MHz, on 3895 MHz and within the range 7250 to 7750 MHz. Transmissions between 3420 and 3700 would not interfere with COMSTAR III at 86.9 degrees west nor would transmissions in the so-called 'military' band 7250 to 7750 MHz. However for the 3420 to 3700 region to be utilized the satellite would have to have an input range on uplink which was capable of precluding any signals which upon translation could come out **above** 3700 MHz or transmissions directed at COMSTAR III would also be repeated in the 3700 and up region. Best bets remain that **if** this

satellite is actually in use, it is being used **only** in the 7250 to 7750 region. [6] - These birds are not operational in the 3.7 to 4.2 range. [7] - ATS-3 was south of the equator at 8.0 degrees. [8] - ANIK II is primarily a spare, having been replaced by ANIK-B's 4 GHz capabilities in the spring of 1979. [9] - SIRIO is an experimental Italian 4 GHz downlink satellite with an EIRP capability near 29 dBw; it was probably 'passing through' in transit to some other location when these ranging measurements were made, **or**, the report was in error. [10] - CTS-I (also known as Hermes) was last operational in this location conducting demonstrations of television relayed between Canada and Australia using 200 watt output stages in the 11/12 GHz band. CTS-1 has been formally declared 'dead' subsequently. [11] - ATS-1 remains operational (far beyond its design life) and while it has 4 GHz downlink capabilities most of its efforts in the video area have been at 2.6 GHz where it recently relayed programming for PBS to American Samoa and conducted tests with receiving terminals on Guam. [12] - Symphonie II was reported at this location in November; probably 'passing through'. Symphonie were early experimental birds with 6 GHz up and 4 GHz down, EIRPs in the 29 dBw region, operated by the European Space Agency. During December Symphonie I was utilized to relay television coverage of the test Ariane launch in French Guiana to France. The exact footprint (i.e. whether Global, hemispheric or spot in configuration) is not known.

In addition to these birds which are viewable for most **CSD** readers to at least some extent, we also have:

1)RADUGA 3 at 35.3 degrees east
2)GHORIZONT I at 52.3 degrees east
3)RADUGA 5 at 84.2 degrees east
4)BSE (Japanese experimental satellite) at 109.1 degrees east
5)INTELSAT IV-F at 177.1 degrees east

The Raduga series birds are known to have the capabilities of downlinking at 3420-3870 plus 3895 MHz, as well as the previously noted 7250 to 7750 MHz. The Ghorizont series birds are operational with channel centers at 3695, 3745, 3845, 3895 and 3945 MHz. The non-Clarke orbit birds (Molniya) of the Russians are said to be operational between 800 and 1,000 MHz plus 3400 to 4100 MHz although televsion has **only** been observed at the 3895 MHz frequency. One report notes that 'telemetering' is in the 800 to 1,000 MHz span but neglects to note where in that region it is located.

U. S. DSCS Clarke orbit birds are known to have telemetering at 7250.1 and 7675.1 MHz with downlink operation channels of 7250 to 7370, 7400 to 7450, 7490 to 7675 and 7700 to 7750 MHz. The 7400-7450 and 7700 to 7750 channels sound as if they 'might' be capable of video relay (simply because of their bandwidths).

SPTS '80 CALIFORNIA

- FUN-TASTIC! -

COMING UP FAST

SPTS '80 / San Jose offers low cost satellite system enthusiasts the opportunity to participate in what may well go down in satellite history as the most exciting satellite event of all time. Strong words but an equally strong program is shaping up.

First the basic facts. The dates are July 4, 5 and 6. The location is the San Jose Hyatt immediately adjacent to major north-south and east-west throughway (they call them 'Freeways' in California) intersections and perhaps three minutes by vehicle from the San Jose airport.

At the first SPTS we managed to provide a facility where attendees could bring their own VCR gear and videotape the proceedings from feeds created by the South Oklahoma City Junior College video staff. We missed that in Miami because of the open and 'public' nature of the Bayfront Park Auditorium. SPTS '80 California will bring back the ability to videotape the proceedings with a new twist; you can do it in the comfort of your own room (provided you are among the first 500 to register and thereby get into the San Jose Hyatt).

This will be a very California-style 'satellite-video-event'.

All sessions are planned for videotaping. Then each evening and over a part of the next day (scheduled so as to not interfere with the live program) we'll be feeding back on two separate in-house MATV system channels the day's events. You can tape the events in your own room during playback by simply plugging your own VCR into the 75 ohm outlet in your room. Additionally, we'll have another twenty hours or so of videotape on the system during the three days including some live 'TODAY at SPTS' coverage in the early morning (8 AM'ish) period with studio guests from the program people and attendees at the event. We've even invited the exhibitors to provide us with videotape tours of their plants or installations which we'll schedule onto the in-house MATV system. All in all we estimate a person who wanted to videotape everything we feed out will need around 50 hours of blank tape!

For those who have been looking for the opportunity to attend the **full 12 hour H. Paul Shuch** 'Mini-Symposium' on TVRO System Design, we'll be running Paul's full 12 hours of lectures (from SPTS '80 in Miami) on Saturday July 5th. Anyone who can sit through all 12 hours and still walk a straight line afterwards will have earned a prize for stamina!

And even if you are not into videotaping stuff, and have no desire to do this with the program material offered via the twin-channel system at the Hyatt House, just being there and having access to a 'crash course in technology' may well be an opportunity never to be repeated again. Let's face it...a full 1,000 attendees are anticipated and the size of our group is getting so large that future SPTS events may not be able to offer this type of full menu service.

Now as for new technology - well, there are some hints of it in the various reports appearing elsewhere in this issue of **CSD**. For example, Sat-Tec's new $995 wired and tested receiver (or $695 kit) is sure to create a big crowd. Star Antenna (now Satellite Television Systems, Inc.) has a most intriguing

STAYING AT THE SAN JOSE HYATT

I would like there to be a minimum of confusion regarding just what each SPTS '80 San Jose registrant can expect from the San Jose Hyatt House. We have 'blocked' the full facility; that is, it is ours less a handful of rooms already spoken for. **BUT** - this blocked set of rooms can only be held **until June 13th** (21 days prior to the 3rd which will be the check-in day for most people). **When you register with SPTS** we send you a four page written confirmation, instructions et al **PLUS** a card that **you return** to the Hyatt for the room registration. **NOW - the last date** you can register with the Hyatt and have your reservation held with no deposit **is June 13th.** BUT - if they run out of rooms before then (which now appears very likely) you will be booked into the nearest facility that has similar (although somewhat higher) rates. Can you afford to wait to register for SPTS? **ONLY** - if you don't care where you stay!

Bob Cooper Jr.

DR. ZWORYKIN [left] who is generally credited with the development and refinement of the all electronic television system dropped in at SPTS '80/Miami. He's 90+ years young! (photo courtesy Nelson Ethier, Montreal, P. Q.)

new 13 foot antenna system with total operator-chair remote control. The Howard Terminal Receiver may well be into commercial production by SPTS '80 San Jose (we'll be surprised if it is not!) and Tay has a new rotating feed system he and Bob Taggart of Chapparel have worked out that will cause you to scratch your head in wonderment. The first (and perhaps second) "everything mounts at/in the feedhorn" home TVRO system (full electronics in the antenna feed with a six conductor cable coming down to the set top control box) is also likely to appear at San Jose. One and perhaps two new (to SPTS) LNA suppliers have signed up for display and many new antenna and complete system suppliers are also on the roster. The new '8-Ball' antenna from Hayden McCullough will be on display and another spherical design is promised with no fewer than four simultaneously operating feedhorns each selecting a separate satellite.

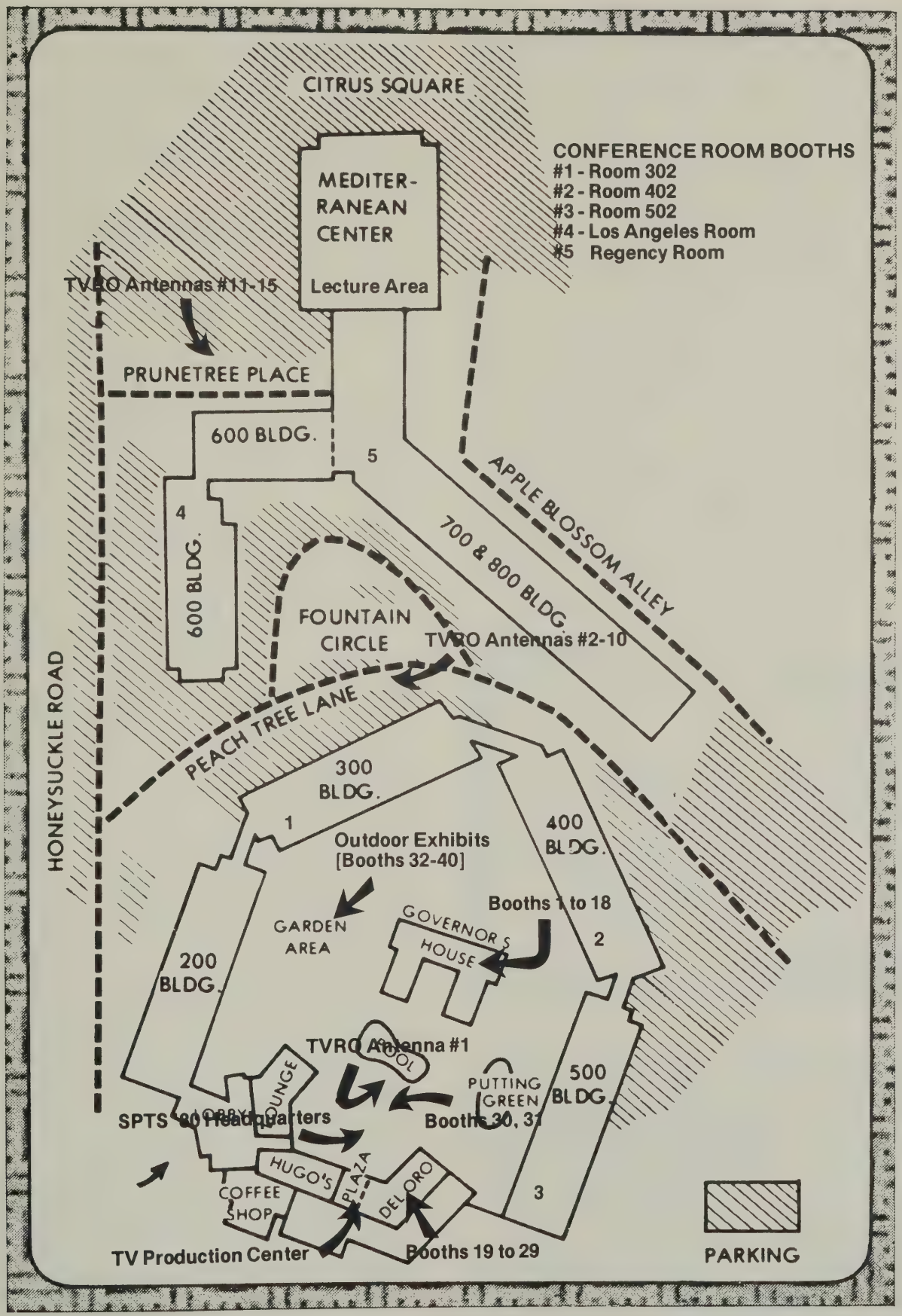
At least a couple of the 'major' (**i.e. CATV type commercial**) firms will be on hand to display their own newly developed 'private TVRO system packages' (sooner or later we knew they'd join us!) and the competition for dealers and distributors is going to be hot and heavy. Virtually everyone who was at SPTS '80 in Miami as an exhibitor will be back again with the emphasis (thank gosh!) on prompt delivery and dealer support programs high on the list.

The San Jose Hyatt facility is quite unique and we'll be taking advantage of that fact. A master sessions area (the **Mediterranean Center** - see layout map) will seat 1,000 at capacity and we'll split it up between high-technical (i.e. engineering) and not-so-technical sessions. We've arranged the three day program so that there will be an almost constant stream of sessions in both areas from 10 AM until into the evening hours on July 4th. **On Saturday the 5th** there will be a full day devoted to exhibit booths, and group demonstrations. We'll keep the twin MATV 'SPTS TV' channels filled all day long but there will be no live seminar sessions that day to insure that you have **a full day** open to really explore the dozens of exhibits and meet and talk with other attendees. On Sunday the 6th we'll have sessions from around 9 AM until 3 PM. The MATV system will repeat the day's sessions until early in the evening so anyone who wants to catch it all had better plan to stay over until Monday AM the 7th.

Many attendees are planning to arrive on Thursday the 3rd. There will be no formal sessions that day; the exhibitors will be finishing their installations, the new industry Trade Association SPACE will hold a general meeting that evening and we'll have material on the MATV system through the evening hours.

Now some answers to some of the questions we are hearing:

1) **What happens after the San Jose Hyatt is filled up?** Lots of people have made reservations **directly** with the Hyatt **prior to** getting from SPTS their official Hyatt registration card. **This is a bad mistake** and we wish you wouldn't try this end run! First of all, you will probably be charged a higher daily room rate this way. Second of all, if you then try to go back and make a second reservation with the official SPTS registration card, you may well cause somebody else to miss the opportunity to stay


CITRUS SQUARE
MEDITER-RANEAN CENTER
Lecture Area
CONFERENCE ROOM BOOTHS
#1 - Room 302
#2 - Room 402
#3 - Room 502
#4 - Los Angeles Room
#5 Regency Room
TVRO Antennas #11-15
PRUNETREE PLACE
600 BLDG.
5
4
600 BLDG.
APPLE BLOSSOM ALLEY
700 & 800 BLDG.
FOUNTAIN CIRCLE
TVRO Antennas #2-10
HONEYSUCKLE ROAD
PEACH TREE LANE
300 BLDG.
1
400 BLDG.
Outdoor Exhibits [Booths 32-40]
Booths 1 to 18
GARDEN AREA
GOVERNOR'S HOUSE
2
200 BLDG.
TVRO Antenna #1
POOL
LOUNGE
PUTTING GREEN
500 BLDG.
SPTS Headquarters
Booths 30, 31
HUGO'S
PLAZA
DEL ORO
COFFEE SHOP
3
TV Production Center
Booths 19 to 29
PARKING

there. Don't do it. If you have reserved space ahead of time, send in the card SPTS provides you for special rates and specific registration to attend the seminar period and **ask them to cancel your earlier** (non-SPTS) **reservation**. After the Hyatt is filled, the people there will start placing late registrants at other nearby motels/hotels.

2)**How can I videotape if I am staying someplace else?** Make a friend with somebody who is staying there. All past SPTS events have been very friendly!

3)**Can I get my family into SPTS?** Only if you pay for them. Badges for entry into the exhibit area will be carefully policed as will badge entry into the sessions be mandatory. There will be one special period on Saturday the 5th when wives and children accompanied by registrants with badges may get into the exhibit areas (we recognize you want to show the family what you just spent several thousand dollars for!). No, your brother-in-law Harry from Milpitas does not look like your wife (we hope for your sake) and he'll have to stay out; unless he registers.

4)**I have all of the STT manuals. Can I get a partial refund?** No you won't; we'll have a couple of **new** ones in San Jose and everyone who registers gets his choice of **any two** manuals in the STT library **as a part of** his registration fee.

5)**I would like to tour DEXCEL and some others while there.** Yes, several of the high technology firms are located within a short drive (DEXCEL for example is five minutes away) and most have told us that they will be happy to arrange a plant tour for either Thursday the 3rd or Monday the 7th. Talk to each directly however.

6)**50 hours of videotape???** That's our ballpark estimate for now. If you are a glutton for punishment and want to tape everything sent out on the MATV system.

7)**How can I tape both channels if I want everything, with only one machine?** Bring two machines. Or, make a deal with somebody else to each tape one channel and then exchange dubs afterwards. No, we can't repeat everything twice at different tiems because if we did nobody could leave before Labor Day!

8)**This whole thing seems either too good to be true or crazy!** Being crazy is not a requirement of attending but it might help!

Registration? See special registration card between the Technical and Programming sections of this issue of **CSD**. See you in San Jose!!!

THIS PRODUCT NO LONGER AVAILABLE

HORN-OF-PLENTY

High quality brass/copper parabolic [illegible] covering 0.3 to 0.6 f/D ratios with standard CPR 229G flange plates for virtually any parabolic dish.

PLUS [illegible] and cable for VRO installation. Reasonable prices, prompt delivery.

ICA
P. O. Box 202 [illegible] OK 74344
Tony Bickel at [91[illegible] 786-5349]

COOP SUGGESTS PRIVATE VIEWERS SUPPORT OWN SERVICE

DO IT OURSELVES?

One of the major problems faced by the new legal arm of the new SPACE group (see story this issue of **CSD**) is the definition of what a private terminal viewer is, and what rights he has in the scheme of things. For example, can a private viewer access such Common Carrier transmissions as WTBS or WGN (et al)? The carriers themselves are split on this issue; WTBS's SSS believes private viewers are not entitled to service, even when they are willing to pay the fee. WGN's United vacillates between agreeing to accept private viewers and not accepting them. What about the non-Common Carrier transmissions? For example, HBO and SHOWTIME and WARNER's 'The Movie Channel' are **not brought** onto the satellite by a Common Carrier. The programming firms themselves lease the transponder time, set the rates (which are not regulated as Common Carrier rates are regulated, at the FCC) and police the systems. Can such a firm **legally deny** service to a private viewer who is **willing** to pay the rate? Can rates be established for private viewers which are markedly different (i.e. higher) than the so-called 'wholesale rates' which cable firms pay? As regular readers are well aware, 'The Movie Channel' will accept private viewers ($96 per year) but SHOWTIME and HBO will not.

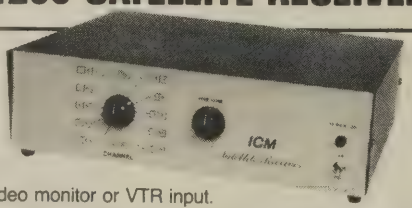
What about off-shore reception terminals (since this is, like it or not - and that depends upon who and where you are whether you like it or not - an 'international' service)? What laws govern reception of HBO, for example, in the Bahamas or WTBS on Grand Caymen? **One study** recently completed **suggests** that unlike the Canadian-US agreement inked back in the early 70's prohibiting internal domestic reception of each other's domestic satellites, there is currently no law or written agreements covering this between (say) the US and the Bahamas or Grand Caymen. **Lacking** such **direct agreements** between nations, such reception (and even re-use of the programming) may well be just as legal as cable systems receiving (under agreement) the same signals within the USA.

Clearly - the picture is unclear. Something those of us who have been at it for some time already know well. Just as clear is that SPACE, as a group designed to tackle, define and then resolve these problems, has its work cut out for itself. And, equally clear is the mandate that these problems need to be resolved.

One school of thought suggests that lacking a clear cut line

NEW ICM TV-4200 SATELLITE RECEIVER

Provides You With These Features For $1,995



- Output levels compatible with video monitor or VTR input.
- Dual Audio Outputs 6.2 and 6.8 MHz. • Built in LNA power supply
- Tunable Satellite channels 3.7-4.2 GHz.

International Crystal Mfg. Co., Inc.
10 N. Lee Oklahoma City, Ok. 73102 405/236-3741 ICM

of **direct approval** for what private terminals receive, the terminals are on quasi-legal quicksand just waiting for the sheer weight of numers to sink us all into the quagmire. Those from within the new industry who harbor this thought suggest that as a group we should be taking steps to insure that we have some readily identifiable reason for being; pending resolution of the prior stated problems. One suggestion kicked about is that a group of private terminal operators could, if it wished, become (through a group such as SPACE) its own programming entity. That sounds pretty far out until you start to work with the numbers involved. Then it takes on an aura of not only being distinctly possible but even perhaps feasible as soon as the end of this year. Let's see what that is all about.

Premise One

Whether HBO/SHOWTIME/'The Movie Channel' are Common Carriers or not, the people they rent transponder time from are carriers. Which simply means that if you have the change in your pocket to pay the FCC-regulated-tariff, and if the time you wish to purchase on the satellite is available, Western Union or RCA or ATT/GTE **must** sell it to you. They cannot deny you access to their birds.

So what does 'time' on the bird cost? Regardless of what it is, the charges are regulated and therefore the buyer has some (FCC) protection in knowing that he is not being selectively charged a higher (or prohibitive) rate. Let's look at ballpark type figures for our discussion:

1)**INTELSAT** - has just recently lowered its rates. You can now purchase 24 hour (1/2 transponder) video on one assumes (we don't know for sure) a hemispheric beam for $800,000 per year. A lot of money? Yes, but divide it down by an hourly rate. There are 8760 hours in a 365 day year so it works out to $91.32 per hour.

Hey, that is right reasonable!

2)**DOMSATS** - rates vary between Western Union (the highest domestic US carriers) and RCA SATCOM's. Western Union (WESTAR) rates average from 10 to 18% higher than RCA largely because WU likes its customers to take short bursts of service on an occasional (per event) basis rather than contract for fulltime services.

There are three 'classes' of service with RCA; the highest class is a protected kind of service wherein the user is assured that even in the event of a transponder failure (or complete bird failure) that RCA would 'restore' service to the leasee somehow, someway. That one works out to around $1.2 million per year and in our 8760 hour year comes to $136.99 per hour. Folks in the cable service group usually prefer to have this highest-grade or protected service since they know they would be out of business in a hurry should there be one or more transponder failures related to their service offering.

The lowest class of service is pre-emptible and not guaranteed. In essence, if the user has this class under lease he **can** lose satellite distribution if [1] his own transponder quits, or, [2] if someone with a higher class of service loses their transponder. This rate is in the $800,000 range and like INTELSAT it comes to around $91.32 per hour spread over 365 days, all hours.

3)**ANIK** - are in a class all by themselves since nobody has ever **really** bought any time on them. And small wonder; while the rates are not generally known there have been attempts by Telesat to peddle full time unprotected transponders for around $2.5 million per year which works out to $285.39 per hour.

The Canadian rate might make sense in the United States where the total 'market universe' is reasonably large but in Canada where the entire population could fit into California the rates are way out of line.

The premise here is that a group, say a group officially represented by SPACE, would contract for satellite time. In other words, create a 'Viewer Satellite Network' system wherein the members of the group on some type of assessment basis would be paying for the cost of the transponder. If $800,000 is a lot of money per year but $91.32 is an affordable amount of money per hour, how do you get from the larger to the smaller number without tripping over the red ink? Bulk is the answer; a big bunch of people all working together through someone such as SPACE to chip in the nickles an dimes required to pay the bill.

All of this is 4th grade math. Say you have a $91.32 transponder bill to service each hour. What might that cost per SPACE member (or any other group that could bring in sufficient 'bulk')? Well...

1)**At 1 cent per member per hour** (24 cents per member per day) **it would take 9,132 members**. Very quick math, right?

Humm. That seems almost affordable! After all, 'The Movie Channel' churns out 24 hours of television per day for a flat $96 per year and several hundred thousand people are willing to pay that rate (cable customers who get the service via satellite). Our paper projection actually calls for far fewer people (9,132 vs. hundreds of thousands and about $8.00 less per year).

Of course there are not 9,132 private terminals out there... yet. BUT - that number is not that far out of line with where this industry could be within say a year. So none of this is totally blue sky, just a bit premature.

Ah yes, you say, but unfortunately the cost of the transponder time is hardly all that is involved. You also have the cost of uplink. What does that involve?

Well, unless you own your own uplink station, you'll have to take your programming to somebody who does have one and they'll charge you money for using it. How much? The rates vary but if you take the actual cost of utilizing the uplink transmitter (a ballpark charge is $40 per hour) and add to that the cost of utilizing the uplink station's videotape playback equipment (another ballpark-charge of $15 per hour) you now have another $55 per hour to spread amongst the participants. If we have our original-example number of 9,132 people involved that works out to $00.00548 per 'member' per hour or round it off to 55/100ths of a penny each per hour. But on an annual basis that comes to another $47.96 per member per year. Now we are up to $87.60 + $47.96 per member per year or $135.56 per member per year. Unfortunately we haven't addressed two final (but unavoidable) costs for operation yet; the cost of programming, and, the cost of managing or administering the whole system. Can someone estimate what such costs might be? Obviously the cost of programming depends upon the nature and quality of the material. And management...well, the way some of the commercial services seem to be running one could safely apply the old adage that the costs will rise to the level where there is no excess money left over!

So what on the surface looks quite enticing may not be so enticing after all. We started off with a backed-into-number of participants (because it divided easily by one penny per hour) of 9,132 'members'. Obviously if that number were twice as large, the costs would drop 50%. Or if the participant number were 50% as large, the number would jump by 200%.

Premise Two

As nice as having your very own 24 hour transponder

SLOW - TVRO System Delivery ?

ANXIOUS to get your earth station up and running? Tired of getting the run around on receiver and LNA delivery? Check with AVCOM!

AVCOM's field proven PSR-3 receiver is in full production. With remote tuning, dual video outputs, our exclusive Clamp-Sync and Scan-Tune, the PSR-3 is the finest TVRO receiver on the market. Combine this high-quality receiver with our in-house-stock of high quality 120°K (50 dB) LNAs and you have the best private terminal package available today. PLUS - **we deliver radios and LNAs**...not promises! YES - AVCOM always has room for one or two more qualified dealers and distributors.

AVCOM of Virginia, Inc. (804)320-4439
10139 Apache Road, Richmond, VA 23235

Transponder	Service	Contact	Telephone	Address
1	PTL	Cathy Wallace	(704)554-6080	7224 Park Rd., Charlotte, N. C. 28279
2	**KTVU** [*]	Carolyn McCrory	(212)944-4205	Sat Comms., Warner-Amex, 1211 Ave. of Americas, 15th Flr., NY, NY 10036
3	WGN	Roy Bliss	(800)331-4806	United Video, 5200 S. Harvard,. Tulsa, OK 74135
5	Movie Ch.	Gary Koester	(212)944-4261	Warner-Amex, 1211 Ave. of Americas, 15th Flr., NY, NY 10036
6	**WTBS** [*]	Sel Kremer	(918)481-0881	SSS, Box 45684, Tulsa, OK 74145
7	ESPN	Jim Bates	(203)584-8477	ESPN Plaza, Bristol, CT 06010
8	CBN	Scott Hessek	(804)424-7777	CBN, Virginia Beach, VA 23463
9	C-SPAN	Jana Dabrowski	(703)525-3030	3800 N. Fairfax, Arlington, VA 22203
9	**MSG** [*]	Bill Padillino	(201)337-2225	Five Fir Ct., Oakland, N.J. 07436
9	**BET** [*]	Vivian Goodier	(202)337-5260	Suite 300, Prospect Place, 3222 N. St. NW, Washington, DC 20007
10	**SHOWTIME** [*]	Que Spaulding	(212)880-6621	1211 Ave. of Americas, N.Y., NY 10036
11	Nickelodeon (see 5/Movie Channel)			
12	**SHOWTIME** [*] (see 10/Showtime)			
13	TBN	Bill Miller	(714)832-2950	Box 'A', Santa Ana, CA 92711
16	ACSN	Dave Buckingham	(202)673-7866	Appalachian Reg. Comm, 1666 Connecticut Av., Washington, D.C. 20035
17	WOR	Sam Morse	(315)455-5955	P. O. Box 4872, Syracuse, NY 13221
18	GALAVISION	Fred Landman	(212)557-9050	250 Park Ave., NY, NY 10017
20	TCS Sports	William Strong	(412)36$1-5758	890 Constitution Av., New Kensington, PA 15068
21	**SPN** [*]	Sel Kremer	(918)481-0881	Box 45684, Tulsa, OK 74145
21	HTN	Steve Broydrick	(207)774-6334	465 Congress St., Portland, ME 04101
22	Modern Sat. Net	Dee Michael	(813)541-7571	5000 Park St., N., St. Petersburg, FL 33709
22	**HBO** [*]	Winston Cox	(212)484-1715	Time/Life Bldg., Rockefeller Center, NY, NY 10020
23	**Take-2**[*]	(see 22/HBO)		
24	**HBO** [*]	(see 22/HBO)		

THE CURRENT FI PROGRAMMING STOCK - here is a run-down of the program suppliers who presently offer programming on FI. Bold face [*] services want nothing **to do with 'private' terminal systems.**

might be, it may be a little too ambitious for right now. How about something lesser, say 12 hours a day rather than 24? Can you divide the satellite charges by 2?

No, not quite. Satellite time is sold on a sliding scale where the more you buy (up to fulltime service) the less you pay per unit bought (a unit is an hour). For example, walk in off the street and buy one hour once per year and it will cost you around $900 for that hour (plus uplink and 'deck' time). A 12 hour per day transponder service? It comes, in the lowest class of SATCOM service, to around $111 per hour (versus $91 and change). If you roll uplink time (still around $40 per hour) and 'deck' time (still approximately $15 per hour) into the per-hour-charge on a 12 hour a day bulk buy, you end up with approximately $166 per hour. If you still had 9,132 'members' kicking into the pot that works out to $1992 per day or $727,080 per year which in turn comes to $79.62 per member per year. Again, less cost of programming and cost of managing the whole affair. Humm...perhaps the 12 hour per day approach holds some promise. Are there other things that could be done to whittle it down?

Well, you could buy less than 12 hours per day - say 1 hour per day. But that gets down where the cost per hour for the bird time is getting pretty steep; in the $350 per hour region. When you start taking only an hour per day you are also facing such problems as time zones and perception-of-value (i.e. how much per member could be collected for a single feed of one hour per day?); plus the bigger problem of finding the same hour each day across the board. Remember how busy the transponders are already.

When you really study the time zone problem and others that crop up with 'short days' it begins to appear that for a really worthwhile 'program' the 12 hour day (which HBO and SHOWTIME have been following for good reason!) is a pretty good choice. So what other 'whittling' might be done?

Let's look at the uplink costs. $40 per hour is a bit steep. You have an uplink station (i.e. the equipment), the land upon which it sits, a staff to run it and general management charges. Let's add to that the $15 per hour playback 'deck' time since it is really a part of the cost of the uplinking. That comes to $55 per hour; now what could be done to chop it down to size?

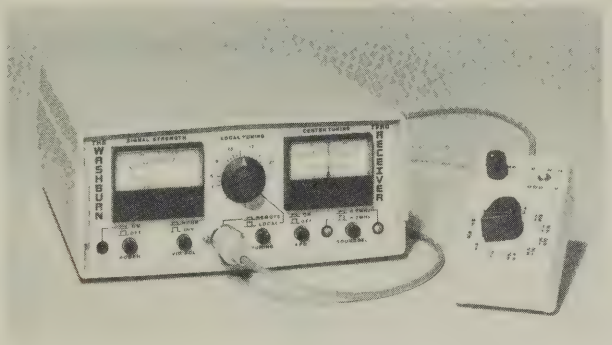
Let's buy an uplink. Egads you say...you've read where they cost $400,000 or $500,000. Check this month's Technical News Notes; there you'll find that Microwave Associates has a new 'transportable' uplink for around $150,000. Remember, big numbers look big only until you apply the 'bulk' to them.

Say you wanted to finance a $150,000 uplink over a quick write off three year period. With a 12 hour on-the-bird day. That works out to 13,140 hours of actual use over the finance-it period. Before we apply the two numbers together let's add another $25,000 for a building to put it in and the land it sits on plus the legal fees to get it licensed. Then let's go all out and put inside the building, along with the uplink electronics another $25,000 in playback and control equipment. That gives us a total investment of $200,000, spread over 13,140 hours of use. Divide it out and you see that we have a per-hour cost of $15.22! That is certainly a lot better than $55 per hour and

THE WASHBURN TVRO RECEIVER

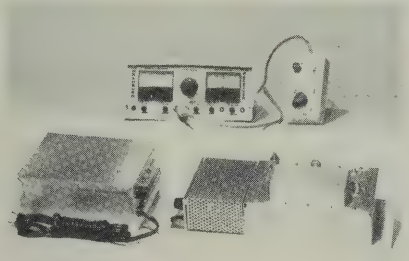
The WASHBURN TVRO RECEIVER is a complete, high performance unit which provides excellent quality picture and sound reception from television satellites. The easy to operate format makes the WASHBURN receiver ideal for any application where non-technical users are encountered, such as the home, job site or resort. Advanced state-of-the-art, technical features such as; extended threshold demodualtion, full band width video and wide range AFC insure professional quality performance for years to come.

The WASHBURN, receiver of the 80's!



STANDARD FEATURES:

- ***EXTENDED THRESHOLD***. . .a state of the art approach to threshold extension that allows sparklie-free reception of program material with CNRs of 8 dB and above, achieved with-**out** compromises in IF bandwidth or video bandwidth and with special design attention to maintaining video phase and amplitude linearity as one would expect to find in a high dollar commercial receiver package.
- ***LOW DISTORTION AUDIO***. . .a unique approach to recovering **all** of the audio bandwidth present on the satellite transmission utilizing a true low-distortion, low-noise, high fidelity audio output with remote control and **automatic** selection of either the 6.2 or 6.8 MHz sound subcarriers; with indicators to show which audio subcarriers are present and a priority selection system so that the presence of some other modulation format (such as slow scan video) on 6.2 MHz will not be selected for listening (but a **normal** audio modulated subcarrier on 6.2 MHz on a different transponder **will** be heard.) Additionally, CCITT (or ANIK) subcarrier frequencies different from the normal 6.2 and 6.8 MHz North American DOMSAT bids can also be received and deemphasis supplied by component value changes.
- ***HIGH PERFORMANCE AFC***. . .that works as well as the RCA home receiver Colortrak® system and provides a very high overall level of dispersion cancellation, eliminating any need for a complex and expensive frequency synthesis system.
- ***AUTOMATIC AND PRECISE***. . .feed rotation control using a readily available, modest-in-cost (TV) antenna rotor assembly.
- ***FULL FUNCTION METERING***. . .dual meters to show received signal carrier to noise ratio (CNR) and AFC center tuning. Meters calibrated directly in db and MHz.
- ***VTR COMPATIBLE INPUTS AND OUTPUTS***. . .to provide easy back-feeding of a home (or neighborhood) MATV system, plus simple off-bird-recording without additional switching or complex cabling.
- ***PROFESSIONALLY DESIGNED AND MANUFACTURED***. . .utilizing an out-of-the-way down-converter (mounting separate from the demodulator proper) with an LNA power supply, a feed rotation system (to allow operational remote control of the feed point antenna for separate reception of vertically and horizontally polarized transponders), a small demodulator console with full provisions for constant monitoring of the system performance, and, a hand-held remote control that allows the viewer to adjust the system to each of the 24 channels found on SATCOM birds (or alternately 12 or ANIK, WESTAR birds) with a remote control. This design allows operation by a non-technical viewer without the requirement for special instructions.



WASHBURN RECEIVER, *fully aligned with one year parts and labor warranty*..... **$2995.00**

WASHBURN RECEIVER, *kit form, 90 day parts only warranty, less rotor motor* **$1495.00**

ramsey electronics **2775 Baird Rd., Penfield, N.Y. 14450 [716]586-3950**

chances are very good the gear will last far longer than 3 years (13,140 hours). Now what is missing? Someone to run it and around 5 kW of electricity per hour. Let's be generous again and add $10 per hour for these overhead items. Now we are at $25.22 per hour; **a savings of $29.78** from our 'pay-somebody-else' overhead of $55 per hour total. That $29.78 per hour saved applies directly back to what it would cost each 'member' per year. At the 9,132 member number it saves him (or her) $14.28 per year. Which brings the 12 hour per day (365 day per year) cost-per-'member' down from $79.62 to $65.34 per year. How does that work out per hour in a 12 hour day? It works out to 1.5 cents per hour or 18 cents per day.

Now that begins to seem quite reasonable again.

But that still leaves us with the programming and management? Yup.

On the surface people pay charges like $5.41 per month ($65 per year) for things such as Home Theater Network; that six-day-per-week, one movie per night service that grabs off the use of transponder 21 every weekday evening (plus Saturday) for a couple of hours. HTN is a good bargain in the marketplace simply because if the family that subscribes to the service sits down to one premium movie per month they've more than got their $5 back. But how would a user group, such as the 'Viewer's Satellite Network', command a paying clientele in the 9,000 size range?

One suspects there are already as many sports and movie and entertainment and religious channels available on the bird as can be supported. Besides the thrust of this is to create a service channel which appeals to and applies primarily to **direct viewers**, not via-cable inter-connected viewers. And for now and the next few years the chances are pretty good the number of such terminals is going to be (in the cable TV universe) quite small. This suggests renting movies, scrounging old sitcoms, digging up old sporting events is not the answer.

One on-satellite service that started out much the same way is SPN; Satellite Program Network. When SSS launched that service in February of 1979 it ran only a few hours per day. It went into the marketplace and offered 'satellite time' for very reasonable rates; as low as $40 per hour in some instances. SPN also went to the cable operators and offered them **free-use** of the channel. For as little or as much of the 'broadcast day' as the cable system wished.

Then a funny thing happened. Hundreds of cable systems took the service. Pretty soon SPN was onto cable systems serving more than 2,000,000 US homes. People who **bought** SPN program time found that whatever it was they were selling with their time (many used their time to entertain/educate and then push products produced or distributed by the program producer) was selling very well. They were making a profit; sometimes a big one. So SPN went from a bold, innovative service that offered time at a very reasonable fee to a service that now charges minimum fees in the $400 per hour region (for 7 AM eastern on Sunday morning!). Obviously this priced some of the program suppliers[*] out of the marketplace (those who were either not selling a product or who were selling something that didn't have any real marketplace in the first place).

If SPN's $400 per hour minimum rates are too steep for some, there is a message here about the dollar potential for anyone with transponder time available. A service that starts out to attract big viewing numbers is bound to end up collecting big user numbers as well. It's just how capitalism works.

***Coop's Satellite Magazine, a fixture first of transponder 24 and then for the past year on transponder 21 left the air after the last week in April because SPN rates raised dramatically to $400 per hour in the 7 AM Sunday [eastern] time slot and considerably higher than that in the familiar 12 noon eastern Thursday time slot. This one hour program had been created and produced by Coop primarily as a means of insuring that people who wished to be kept abreast of the rapid development in satellite and cable teachnology would have the opportunity to do so. Present plans are to return the program to the satellite this coming September in perhaps a different format.**

If there is already too much 'entertainment' on the bird, what about education? Well, there may be something here. Let's go back and look at the cost per 12 hour day for a Viewer's Satellite Network. Less programming and management, we whittled the per hour cost down to $136.22 (satellite time **plus** three year amortization of the uplink site and equipment **including** $10.00 pe hour to run it). Could enough of the twelve hour day be 'sold' so that the remainder would be ''free'' to VSN members? Possibly.

Each twelve hours of such a project would eat up $1,634.64 (12 x $136.22). Suppose you set out to 'sub-let' **six** of those hours for sufficient money to cover **all** of your daily operating overhead, and still leave you with the remaining **six hours free** of any satellite time or uplink costs. That works out to $272.44 per hour you would charge out to one or more of those 'small groups' who are so anxious to get on the satellite. Since that fee includes use of your uplink and deck charges, guess what. You are actually very competitive with others who would be agreeable to leasing out short blocks of time. In fact, you are cheaper than most.

And now you have six hours free of cost!

Humm. If you could rent 12 hours per day of transponder, put in a $200,000 uplink installation and man it...and turn around and sell just **half** of that time per day and end up with the other half free of any charge, it starts to make some sense why people and firms are getting into the satellite business!

Now let's return to the programming and management portion of the equation.

Elsewhere in this issue we see that SPACE is off and running and the annual membership fee is going to probably end up (after Board decision) being in the $100 range. And we have suggested throughout this piece that if SPACE were, as a group, to enter into the creation of a Viewer's Satelite Network, it could with 9,132 members contract for 12 hours per day of satellite time and provide the membership with their own channel for around $65 per member per year. We have also seen that if you arbitrarily set out to sell say 50% of that 12 hours (six hours) to others for another rather arbitrary (but below present market price) $272.44 per hour (including all uplink charges) that the membership could end up with **six hours a day** of their own programming **for zero dollars**; provided the programming was free and (SPACE) management didn't eat up big dollars in running the project.

The premise here from the beginning has been that this would be a ''Viewer's Satellite Network''. And since these viewers are all primarily interested in one single thing (low cost satellite service) could not the remaining six hours be devoted entotle to programming in that area?

Remember that by selling off six hours, buying our own uplink (and financing it over three years) we have managed to drop the cost per member per year to $00.00. And the annual membership is forecast to be in the $100.00 per year region. Now what kind of dollars might **really** be required to program that six hours per day, 365 days per year, with material that is not found on the other transponders and which does by intent appeal directly and largely to the VSN supporters (i.e. SPACE members)?

Suppose SPACE's board decided to allocate $25 per member per year (out of $100) towards management of not only the affairs of the association but also the management of the Association's VSN service? At the 9,132 member level that comes to $228,300 per year (remember how far the whole private universe is today from the 9,132 level!). Now suppose the same amount of money ($25 per member per year) went into a production budget for the creation of programming for VSN; programming approved by the Board, supported by the membership (who would ideally participate in its creation by becoming where applicable 'video correspondents' who would submit materials on videotape to VSN/SPACE) and produced as economically as possible by and for the 'network'. If you planned to repeat each four times during the year (i.e. create 25% of the total hours in original programming and repeat for purposes of making viewing times attractive each program four times) you'd end up with a total of 2,190 hours of VSN materials per year and 547.5 hours **original** (i.e. new each year). With a budget of $228,300 (25% of the total membership fees at the 9,132 member level) that comes to $417 per hour as a

budget. What can you produce for $417 per hour?

You'd be amazed. For example, a two man crew plus 3/4 inch equipment could spend one full eight hour day with Taylor Howard for less than $417 at going **commercial** rates. Or Robert Coleman or Clyde Washburn or David Brough (etc.). If a semi-volunteer crew from SPACE membership did the field work, the costs would fall by 50% or more. And out of such a visit with just one of these chaps could come perhaps 4 hours of edited material. Ready to roll on VSN!

Or look at the present STT library of low-cost satellite technology videotapes. Between the first two SPTS events and all of the field sorties Coop has made since this whole craziness began, we find around 100 hours already produced and ready for airing; that's roughly 20% of a full year of program material just sitting there ready to be used!

A True Viewer's Network!

Yes, it all looks quite intriguing on paper. Double-yes, we started out with a rather backed-into number of 9,132 'network members' and that **is** an unrealistic membership goal for a group such as SPACE for the next year or more.

But through all of this we hope you have learned that the economies of bulk (or 'scale') that apply to satellite networking are very real and everyone involved in the satellite revolution should recognize that they exist.

There has been a bunch of numbers in this reporty and we suggest that if you have gotten this far you should **immediately go back and read it all over again** to become more familiar with some of the critical numbers.

This has been a 'think piece'. The numbers are real. The potential to accomplish exactly what is outlined here is real; on this or a smaller scale. The number of 'small terminal enthusiasts' is growing every day and in the not too distant future the kind of 'critical mass' assumed here for this particular set of numbers will be available. The opportunity to establish this type of service will pass by only one time. And the time to start planning for it, through SPACE perhaps, is now. The coming SPTS '80 in San Jose could well be the time and the place to start the ball rolling!

LOW NOISE AMPLIFIERS
MAJOR BRANDS-Low Prices-Write!

3.7 — 4.2 GHz DOWNCONVERTER

2 GHz in, 70 MHz out
one control tuning
ion - stable
ed $895.

THIS PRODUCT NO LONGER AVAILABLE

Polarized Rotation

- Teflon PC Board ... x4" $14.00
- Chip capacitor kit 12 each, ... 7, 39, 220, 470 pf...only $18.00
- SMA and Type N connectors
- .141" Semi-rigid coax $3.45 per foot
- 2"x14" copper tube for Birkill feed. $12.00

SATELLITE INNOVATIONS
P. O. Box 5673, Winston Salem, NC 27103

Add $2.00 shipping and handling.

PROGRAMMING CORRESPONDENCE

VIEWING IN SWEDEN

I have read your material with deep interest and would like to pursue the possibility of utilizing a parabolic antenna here in Stockholm to access the TV satellites aimed at the North American continent. Is this feasible? My intention is to tape on our VCR the U.S. programs from various sources in the U.S. and then replay them for our Embassy staff and families. At the present time the two to four week delay makes the programs quite old by the time we receive them here in Sweden.

Adriaen M. Morse
First Secretary
Embassy of the United States
Stockholm, Sweden

Sorry, U.S. domestic satellite signals do not cross 'over the pole' into Sweden. The only signals that cover a wide area and cross the pole are from the Russian Molniya series satellites and we doubt that's what you want to show off to the American staff there in Stockholm! However, with your 'pull' we suspect you could get into the now under construction INTELSAT system which will be carrying U.S. programming to foreign U.S. bases spread around the globe and due to start operation late this year. In the interim you'll have to run videotapes into the Embassy via diplomatic mail pouches. (Wonder if they worry about copyright problems with those tapes!)

UPDATE ON '8 BALL' ANTENNA

Hayden McCullough's **Vidiark Electronics Development Company** (P. O. Box 57, Salem, Arkansas 72574) is going to be close to schedule with delivery on their '8 Ball' spherical antenna described in the April issue of **CSD** (see page T10). McCullough reports he expects to begin delivery of the 12 foot antenna around the 15th of May.

The antenna is in the spherical family and Hayden describes the geometry "pure Oliver Swan" although the mechanics of the construction and design are pure McCullough. Like any member of the spherical family you can 'change satellites' by simply relocating the feed (leaving the reflector stationary) or alternately install two or more feeds for simultaneous reception from two or more satellites.

The production version of the antenna (kit) is priced at $475. McCullough tells us that while the original antenna used strips cut out of 1/2 inch (marine) plywood for the support system for the window screen reflector surface he has since upgraded to a good grade of Redwood after determining that the Redwood is likely to last 'decades' while the plywood might not make it through a difficult winter. Redwood is of course more costly than plywood and thus the price increase.

What you get for $475 is everything you need to assemble a 12 foot '8 Ball' antenna. The steel members are cut and drilled and primed. The redwood pieces are cut but you will punch your own holes in each strip (perhaps a one hour job total time with a hand drill). All bolts and other hardware including a detailed assembly manual amply illustrated with photos is included. The price is FOB Salem, Arkansas and includes the crating cost of the materials.

The reason for utilizing redwood (or other wood) strips is to provide a low cost method of attaching the reflective screen to the spherical surface. You do this with a staple gun. That's about all that Vidiark does not supply; the staples, since they must mate the particular brand and model of staple gun used.

McCullough says the feedhorn for his antenna is also nearing completion as a production item and he hopes by the middle of May to be able to supply not only the full reflector system (kit) but the feedhorn as well . Pricing on the feedhorn is not established yet but he feels it will be substantially below the present $80 price range of conventional horn antennas.

McCullough recently constructed, with the assistance of Canadian David Brough, a 16 foot version of the antenna and reports that sometime this summer a 16 foot version will probably be added to 'the line'. McCullough's Vidiark will be exhibiting at SPTS '80 in San Jose and we predict he will be a very busy guy there!

ADM antenna shown in Miami has undergone considerable structural improvement and now boasts new heavy duty paint surface plus improved surface accuracy. Firm is also bringing out extension panels to enlarge surface area to 13 feet and hopes to show a motorized 4.6 meter at San Jose in July.

BIRD OPERATIONAL NOTES

RESULTS IN CARIBBEAN and Central America starting to come back following SPTS '80 Miami event and first introduction of low-cost TVRO systems in area. One SPTS delegate took 11 foot ADM antenna plus 100 degree LNA and AVCOM receiver back to **Bahamas** where he found sparklie-free reception on at least five FI transponders (including 7, 11, 20 and 23) plus well-above sparklie reception on WESTAR and COMSTAR birds. He later upgraded ADM 11 foot antenna to 13 footer with proto-type extension panels supplied by ADM and improved reception even further. Similar results in **Dominican Republic** with 13 foot H & R, ICM receiver and 120 degree LNA. Down in **Costa Rica**, experimenters Erik Roy and Jose Ignacio report Roy's home brew five meter (window screen surfaced, wooden rib) dish equipped with ICM receiver and 34 dB gain Dexcel LNA has produced sparklie-free reception on COMSTAR D3 bird transponder 23 (used for transmission of remote network baseball games back to network headquarters); other tests continue in this pioneering effort. This note: COMSTAR watchers note typical aural sub-carriers are on 5.8 MHz for program feeds.

COMSAT GENERAL and Sears have broken off negotiations which both had previously announced as 'leading towards' the marketing of low-cost 12 GHz private earth terminals. COMSAT said they 'intend to continue exploring alternatives'...Sears said they regard the business 'consumer attractive'.

SCIENTIFIC ATLANTA is offering cable firms (and others we assume) a special 'package' of equipment which they dub 'The Second Earth Station Package'. Included is a 4.6 meter antenna, dual polarized (with ortho-coupler), a single 1.5 dB LNA, a model 6601 single channel receiver, appropriate jumpers plus 100 feet of downline cable and a pressurization kit for the coax line...for $8,685.

BATTLES OVER finding a 'permanent home' for Ted Turner's Cable News Network continues; Turner worked out court settlement with RCA that gives him right to 'temporary use' of transponder on SATCOM FI, through end of this year but subject to pre-emption if there were other transponder failures on guaranteed service channels. It appears as if Turner **will begin** service on June first start date with CNN but transponder assignment is still somewhat up in air (despite what you may have heard!). CNN suggests 14 (on FI), but other sources note 14 has been 'ill' with the burps for several years and 15 or 19 appear more likely. Advice? Watch closely around June 1, before that keep tabs on 14, 15 and 19 on FI for signs of video 'testing' (sure to start a week or more in advance with color bars) that indicates transponder is being readied for new service.

CHANNEL ASSIGNMENTS on COMSTAR D-2 were finally released by RCA. They held 'out-of-the-hat' impartial drawing early in April to determine which service gets what D-2 transponder. D2 is located at 95 degrees west and footprint map(s) for it plus extensive discussion of what it is capable of appeared in **CSD** for April. Here is line up announced:

Transponder	Service
9 (V)	ESPN [1]
11 (V)	Rainbow Communications [2]
13 (V)	Southern Satellite Systems [3]
15 (V)	Showtime [4]
17 (V)	HBO [5]
18 (H)	HBO [5]
19 (V)	Satellite Communications Network [6]
20 (H)	SIN [7]
22 (H)	TCS [8]
23 (V)	United Satellite [9]
24 (H)	National Christian Network [10]

And the footnotes. [1] ESPN has stated they intend to use their second (they are on 7 on FI) for 'backfeeding' live sporting events to their New England operations center. [2] Rainbow Communications is new 'Prime Time Network' design for 12 hours per day slanted at people over 50 years of age. [3] Southern Satellite systems may have no immediate plans for this transponder and in the event of failure of CNN to stay on FI the CNN service could end up here. [4] Showtime has no immediate plans for service using this transponder. [5] HBO probably will not initiate service on either of these transponders before late in 1981 or early 1982. [6] Satellite Communications Network is making a lot of noise about combining sports and movies into an Ohio-centered premium service for midwest. [7] SIN possibly will use this transponder to make their Spanish Language Network programming available to cable systems. [8] TCS is Pittsburgh based sports service which has been utilizing occasional time on FI transponder 20. [9] United Satellite's plans for this service (they lease FI, transponder 3 for WGN) are unknown. [10] National Christian Network (NCN) plans a 24 hour a day religious programming channel.

Remember that D-2 is likely to have hotter footprint in all portions of the U.S. (and southern Canada) than the best-case FI transponders and areas such as Bahamas are in much better shape with D-2 than with FI.

INTELSAT reduced rates for users of intra-nation feeds (i.e. domestic service); full time (½ transponder) video (with audio) now costs $800,000 per year; a 20% reduction. Countries affected include Algeria, Brazil, Chile, Columbia, France, India, Malaysia, Nigeria, Norway, Oman, Peru, Saudi

COOP'S SATELLITE DIGEST

P15-5/80

SPN PROGRAM SCHEDULE

1980 SPRING/SUMMER

EASTERN TIME	PACIFIC TIME	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
7:00	4:00	INTERNATIONAL BYLINE					VIDEO CONCERT HALL	
7:30	4:30	MOVIETOWN						
8:00	5:00							MONSTER FLICKS
8:30	5:30						DAVID GRUEN	
9:00	6:00	DAVID GRUEN		CANADA NEWS FROM HOME	DAVID GRUEN		HEARTBEAT	
9:30	6:30	FRAN CARLTON					PAUL RYAN	
10:00	7:00	MOSTLY MEDICINE	JOURNAL: AN ELECTRONIC MAG.	DAVID GRUEN	FINANCIAL INQUIRY	RUFF HOUSE	MOSTLY MEDICINE	REX REED
10:30	7:30	HEARTBEAT WEST					GOLF LESSONS	WORLD LEAGUE WRESTLING
11:00	8:00	PAUL RYAN					JIMMY HOUSTON OUTDOORS	
11:30	8:30	CHEF'S SECRETS					CHAMPIONSHIP FISHING	JIMMY HOUSTON OUTDOORS
NOON	9:00	DON KENNEDY'S SPOTLIGHT					WORLD LEAGUE WRESTLING	GOLF LESSONS
12:30	9:30	INTERNATIONAL BYLINE						MOSTLY MEDICINE
1:00	10:00	MOVIETOWN					ENGLISH CHANNEL	JOURNAL: AN ELECTRONIC MAG.
1:30	10:30							FINANCIAL INQUIRY
2:00	11:00							TELEFRANCE
2:30	11:30							
3:00	NOON	CHEF'S SECRETS					CHEF'S SECRETS	
3:30	12:30	PAUL RYAN					DON KENNEDY'S SPOTLIGHT	
4:00	1:00	HEARTBEAT WEST					MONSTER FLICKS	
4:30	1:30	FRAN CARLTON						
5:00	2:00	MOVIETOWN						
5:30	2:30						COWBOY FLICKS	ENGLISH CHANNEL
6:00	3:00							
6:30	3:30	FINANCIAL INQUIRY	CANADA NEWS FROM HOME	MOSTLY MEDICINE	RUFF HOUSE	JOURNAL: AN ELECTRONIC MAG.		
7:00	4:00	VIDEO CONCERT HALL						
7:30	4:30	REX REED	CHEF'S SECRETS	DAVID GRUEN	JIMMY HOUSTON OUTDOORS	CHAMPIONSHIP FISHING	RUFF HOUSE	RFD HOLLYWOOD SOMETHIN' SPECIAL
8:00	5:00	This time period has been assigned to a pay T.V. service. This pay T.V. programming cannot be carried without that vendor's specific authorization. The SPN signal contains cuetones which can enable the SPN user to automatically bridge this pay T.V. time period. Cuetone 517# indicates end of SPN segment and 517* indicates start of next SPN segment						
8:30	5:30							SILENT FLICKS
9:00	6:00							
9:30	6:30							
10:00	7:00	DON KENNEDY'S SPOTLIGHT					REX REED	SPN MOVIE
10:30	7:30	WYATT EARP					RFD HOLLYWOOD SOMETHIN' SPECIAL	
11:00	8:00	BILL COSBY						
11:30	8:30	VIDEO CONCERT HALL						
12:00	9:00							WORLD LEAGUE WRESTLING
12:30	9:30							
1:00	10:00	ALL NIGHT AT THE MOVIES						
7:AM	4:00							

Arabia, Spain, Sudan and Zaire.

TIME Magazine now using domestic plus INTELSAT to send full page layouts to Hong Kong plant where Far Eastern edition is put together.

SHOWTIME has increased service hours to 12 hours daily; starting programming at 3:30 PM eastern (TR 12) and pacific (TR 10) weekdays and 1:30 PM weekends. **SPN** has added re-runs of "Return To Peyton Place" and "Dark Shadows" in 10 PM to midnight EST slot on TR 21 in what they bill as 'Network For Working Women'. **CALLIOPE** (TR 9) is adding Saturday morning kiddy shows to line-up. **ESPN** has increased hours six per day, now signs on at 7 AM eastern weekdays. **HBO** is planning to launch new 24 hour service ('Maxi') during May; will utilize transponder 20 for feeds. 'BBC In America' (new service scheduled to bring six hours per day on TR 20 of BBC programs) has been put back and will not appear before end of this year; then over on COMSTAR.

NPR, inspite of uplink problems, now plans to grow to six audio channels this summer on WESTAR (now four) with down-the-road plans to have as many as a dozen.

SKYVISION, a marketing firm in Chicago, is selling satellite services to apartments and condominiums. They install terminal, wire up building (or plug into existing MATV system) providing up to 7 channels at $15.95 per outlet per month. Package includes The Movie Channel, Nickelodeon, WTBS, WOR and ESPN. Installation cost per location is quoted at $40,000.

IN CANADA, All-View Interphase Systems (Mississauga, Ontario) has begun promoting NETWORK ONE leasing earth terminals to homes, apartments. Service is promoted for direct reception from **ANIK** but of course can also receive SATCOM.

ASSOCIATED PRESS offering 'free $10,000 earth station' to any newspaper members of AP who are into high speed service. AP wants to convert all users of service to satellite.

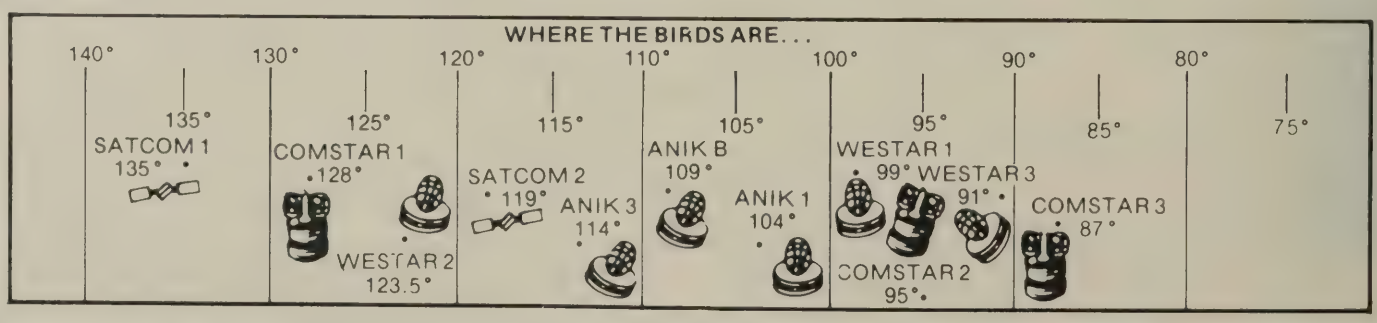
RCA AMERICOM has moved to 400 College Road, East, Princeton, N.J. 08540 (609/734-4000) if you need to get ahold of them.

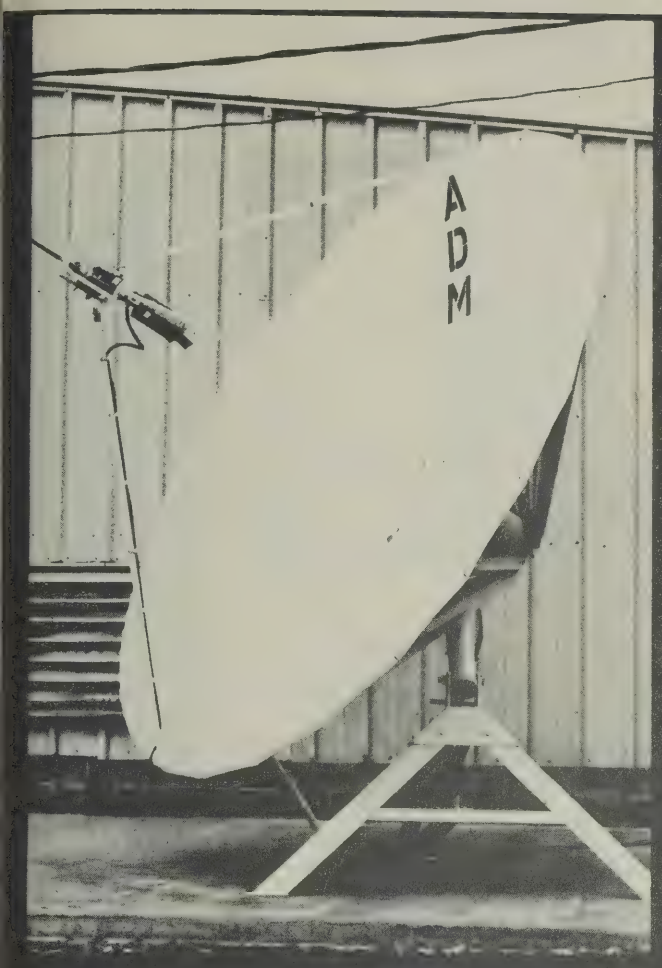
CONTRACT to supply an additional 20 terminals to HI-NET (Holiday Inns) reported by Microdyne; on top of first 87 terminals installed for HI by firm. The newest terminals are to go into franchised Inns; all previous went into company owned establishments.

FCC may have new plan to allow unbridled expansion of MDS terrestrial services (now 2 channels in 2.15 GHz band). Commission is studying plan to allow MDS to move into ITFS band between 2500 an 2690 MHz which in theory could provide up to 28 additional MDS service channels. One observer noted that program sounds like creation of over-the-air cable TV service is behind Commission announcement.

Further details on status of SATCOM FII bird following last September's erratic run-away sequence have been uncovered. Bird experienced partial attitude control loss and intermittent drift while in earth's shadow during semi-annual equinox eclipse period last September 13th. High priority traffic on FII (Alascom and NASA) was immediately moved to FI where four transponders were pre-empted of regular cable TV programming fare. Even with switch to FII Alascom reportedly lost six hours of communications traffic. It took RCA 90 minutes to stabilize FII spacecraft after episode began. Other data relating to FII's present users includes: **Transponder 1** is CBS, ABC, NBC, PBS programming shot to Alaska for taping and later replay on transponder 23 for Bush Terminals. **Transponders 2 and 4** are in use by RCA Americom for voice and data channels. **Transponders 3 and 23** are allocated to Alascom Bush Terminals with video on 23 and audio for 23 video plus other audio and data on 3. **Transponders 5,6,7,10,11,15,19,19,20,21,24** are in use or reserved for use by Alascom (voice and data) communications. **Transponder 8** is reserved for use (under contract) by NBC for feeds primarily between LA/Hollywood and NYC. **Transponder 9** is now in use for AFRTS (Armed Forces Radio Television Service) feeding programs to U.S. bases in such locations as Roosevelt Road, Puerto Rico, Guantanamo Bay (Cuba); much of this **programming** should be off-network U.S. materials selected for enlisted personnel viewing. **Transponder 16** is in use heavily by audio-data channels by such networks as NBC Central, NBC Radio Network, CBS Central, CBS Radio Network Pacific, ABC Radio Mountain and Pacific, National Black Radio Network, Associated Press Radio, Associated Press teletype, United Press International audio news, RKO Radio Network, United Press International teletype, International Media Services, VOA 1,2,3 and 4. Out of operation (i.e. inoperative) are transponders 12,17 and 22. Bird is located at 119 degrees west.

Quick-Satellite-Facts: Audio subcarriers currently in use on SATCOM FI are as follows. Transponder **3** - WFMT (stereo clasical music) is on 5.8 MHz. Transponder **6** - UPI News and Slow Scan is on 6.2 MHz while Easy Listening Music is on 7.4 MHz. Transponder **21** - The Disco Network is on 5.8 MHz while Seeburg Background Music is on 7.4 MHz. **Program control tones** are as follows: Transponder **5** (Movie Channel) turns on east/central receivers with 311 * # and west with 519 * #. Transponder **9** (Madison Square Garden Sports) turns on with 438 * #; Calliope turns on with 168 * #; C-SPAN turns on with 195 * #; and, BET (Black Entertainment Television) turns on with 018 * #. Transponder **10** (Showtime) turns on with 576 * #. Transponder **11** (Nickelodeon) turns on with 749 * #. Tranponder **12** (Showtime) turns on with 576 * #. The Mini-Pay service (Front Row) on transponders 10 and 12 turns on with 481 * #. On transponder **21** SPN utilizes 429 * # while HTN (Home Theater Network, 8-10 PM eastern) utilizes 207 * #. On transponder **22** Modern Satellite Network utilizes 421 * # while HBO (west) utilizes 835 *#. On transponder **23** (HBO's Take-2), they use 529 * # for the eastern two time zones and 681 * # for the western two times zones. Transponder **24** (HBO east) utilizes 835 * #. RCA owned and operated uplinks include Atlanta (not supposed to have video although it has been seen). Vernon Valley (N.J.), Chicago (Lake Geneva), Los Angeles (South Mountain), San Francisco (Point Arena), and Houston. Western Union owned and operated uplinks include Glenwood (N.J.), Chicago (Lake Geneva), Los Angeles, San Francisco, Dallas, Seattle, Phoenix, Atlanta and Honolulu. ATT-GTE uplinks include New York City, Chicago, Tampa, Atlanta, Honolulu, San Francisco and Los Angeles. PBS uplinks include Washington, D.C., Denver, Columbia (S.C.), Lincoln (NB), Hartford (CT) and Talahassee (FL). Independent uplinks include Appalachian Regional Commission (Lexington, KY), C-SPAN (Washington, D.C.), ESPN (Bristol, CT.), Southern Satellite Systems (Atlanta, GA), SIN/Galavision (Los Angeles), CBN (Virginia Beach, VA), PTL (Charlotte, NC), Satellite Systems (Buffalo, NY), KTBN/Trinity (Los Angeles and SIN (San Antonio, TX).





ANYWAY YOU LOOK AT IT...

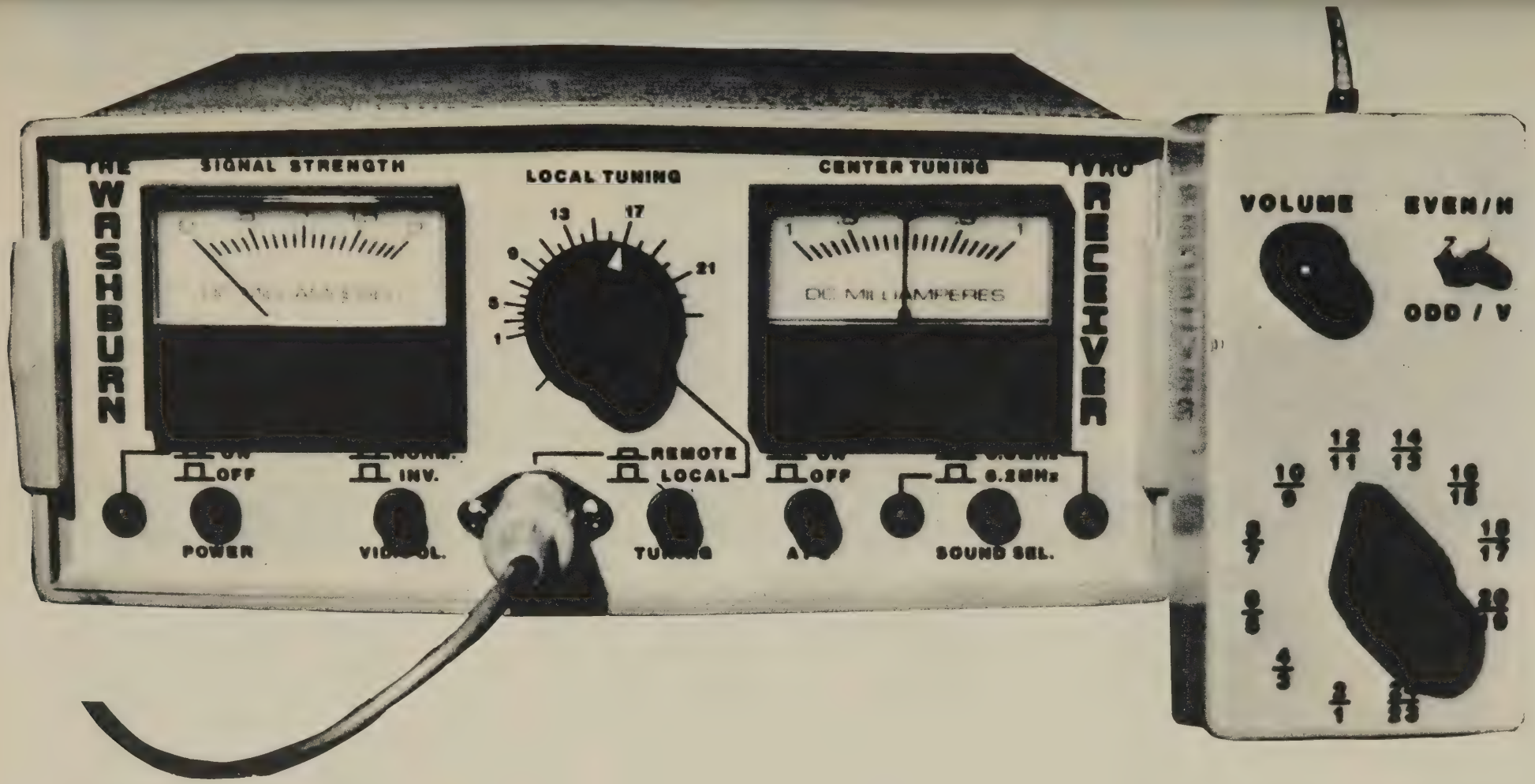
ADM HAS YOUR ANTENNA!

AND YOUR TVRO SYSTEM. Rapid delivery on ADM's super-efficient 11 foot polar mount antenna (includes remote controlled polarization rotation system as well!), plus, packages are available for complete systems including LNA, 24 channel tuneable receiver and cabling. Why wait in a long line when you can get the best, today!

A SUPER TVRO ANTENNA SYSTEM. High quality panelized aluminum 11 foot dish and steel polar mount. Dish weighs approximately 200 pounds, mount 265 pounds. Precision designed, easy installation, zinc chromate base primed and heavy duty white top finish. The rotating feed is standard! Easily shipped and installed. Choice openings for dealers and distributors.

Antenna Development & Manufacturing, Inc.

P.O. Box 1178
Poplar Bluff, Mo. 63901
(1-314-785-5988)



THE WASHBURN TVRO RECEIVER -

Elegant. Superb performance with optimized PLL high-recovery-ratio circuitry. Full operational metering. Handheld remote control. Double conversion, tuneable 24 channel. Selectable audio subcarriers. Commercial stability and much more.

Build it. From the highly detailed new STT manual. Full board layouts, parts location drawings, total parts sourcing, detailed step by step alignment. Or from commercially available parts kits. STT's Washburn TVRO Receiver Manual is available now. See order card in this issue of CSD.

STT Satellite Television Technology / P. O. Box G
Arcadia, OK 73007 [405-396-2574]

INSIDE THIS ISSUE

How Well Does It Work?
SINGLE CONVERSION TECHNIQUES
Narrow Band Services
RECOVERING AUDIO/DATA SIMPLY
Comparing 4 GHz Services
INTELSAT vs DOMSAT BIRDS
Exciting NEW Technology
SPTS SAN JOSE WILL HAVE IT!

COOP'S SATELLITE DIGEST

JUNE 1980

PARAFRAME

Paraframe™ Announces

A NETWORK OF DEALERS TO SERVE YOU BETTER

BASIN ELECTRONICS
P. O. Box 2105
Durango, CO
(303)259-0458

JOHN L. DAVIS
83 Westello
Pocatello, ID 83201
(208)232-2606

REEVES COMMUNICATIONS
1550 West Court St.
Kankakee, IL 60901
(815)937-4519

JERRY PEAKE CO., INC.
2328 Montgomery St. (lower level)
Silver Springs, MD 20910
(301)587-2515

MID-CONTINENT EARTH STATIONS
P. O. Box 81673
Lincoln, NB 68501
(402)474-5486

CFP COMMUNICATIONS
2215 Smith Road
Horseheads, NY 14845
(607)739-2027

NU-VIEW TV, INC.
218 Main Street
Oriskany Falls, NY 13425
(315)821-7225

SMITH RADIO-TV
P. O. Box 62
Ely, Nevada 89301
(702)289-2282

RED'S TV SERVICE, INC.
Fountain Hwy.
Farmville, NC 27828
(919)753-3074

AYERS & JOHNSON
Sevierville, TN
(615)453-6842

TOWER ENTERPRISES, INC.
4424 West Pike Street
Clarksburg, WVA 26301
(304)623-3238

CANADA

KAMLOOPS COMMUNICATIONS, LTD.
913 Laval Crescent
Kamloops, BC V2C 5P4
(604)374-5740

S. FLORIDA & CARIBBEAN

A.B. ELECTRONICS & COMMUNICATIONS
1783 W. 32nd Place
Hialeah, FL 33012
(305)887-3203

DEALER INQUIRIES
Direct to:
Bob Christofanelli
Satellite Systems of Illinois
261 W. Sauk Trail
South Chicago Heights, IL 60411
(312)755-5400

PARAFRAME ANTENNAS are the only antennas that can be 'proofed' on site to render maximum real-world gain. BEFORE your Paraframe antenna has been aimed you KNOW it will give superior performance!

PARAFRAME

PARAFRAME, INC. P. O. Box 423
1000 Sunset Dr. West, Monee, IL
60449 / (312)534-7435

COOP'S COMMENT ON TECHNOLOGY

BEING OUR NEIGHBOR

It must be very trying to be a 'neighbor' to the United States. With the exception of Canada where there is a comparable standard of living the 'overwash' of American communications constantly reminds those who live nearby that we have more than they do, are more advanced in technology than they and generally have more liberal humanistic policies than they.

Canada presents a special case. Perhaps because there is a comparable degree of freedom and political development and economy in our northern neighbor there is also that temptation to 'keep up with the Joneses'. Or where circumstances allow, put the Joneses in a spot where they are playing catch up.

All of this is strongly evident in the satellite business. Let's look at Canada. Because of the peculiar spread of US geography Canada is sort of sandwiched in between our state of Alaska and the 48 lower states. For US satellites to properly serve both ends of the Alaska + 48 equation at 4 GHz Canada is caught in the middle. That works out well if you are in Canada and wish to enjoy US (satellite) television since in the process of serving the two extremes we place a strong footprint over most of Canada.

Because of ANIK and because of the special circumstances presented by Canada's far north (where few people live spread over a large area) the Canadian experiments with satellite relay of television in many ways pre-dated the US efforts and technology. Canadian pioneer Rod Wheeler for example (see separate report in this month's Programming Section) possibly was up and active with his Yukon terminal prior to even Taylor Howard's efforts here in the states. But whereas Taylor was interested primarily in his own private experimentation Rod Wheeler was motivated because his Yukon community needed live television service. Taylor went 'undetected' for several years while Wheeler's first terminal was shut down by the authorities after three days operation.

With justification the Canadian technologists are proud of their pioneering efforts with ANIK. They did it first and that must be acknowledged. But then having done it, they then proceeded to fumble the ball because they couldn't figure out what to do with it! Today they still can't figure out what to do with it (ANIK).

In attempting to protect their own sovereignty and their own industry, and to control this overwash of US satellie programming, they have adopted a number of protectionistic policies. Here is **one** of the strangest and it illustrates the steps a nation will go to in attempting to retain its own national interests.

There is a single manufacturer of LNAs in Canada; a firm called SED in Saskatoon. They turn out between 10 and 20 120 degree K LNAs each month. With the rapid growth of private terminals in Canada it was soon apparent that SED could not supply the marketplace (and furthermore they were more comfortable selling only to the ANIK-trust so in fact made no effort to sell to private terminal operators). Soon US manufactured LNAs were crossing the border into Canada. Virtually all of the US manufacturers of LNAs now have multiple dealers and even a few stocking distributors in Canada.

Now when an LNA quits (as LNAs are apt to do) it must be repaired. If the unit is under 'warranty', the purchaser naturally wants to return it to the manufacturer for no-charge repair. But if the manufacturer is in the states, the Canadian authorities tell the purchaser he cannot return it for warranty repair unless he is willing to **repay the 20-25% duty** applicable when it comes back. The duty is charged on the original **new** price of the unit, irrespective that the second time across the border it was second hand and that there was no new sale here. ''Too bad'' say the Canadian border authorities ''but our policy book here lists SED in Saskatoon as a Canadian supplier of this unit and you should have bought from them in the first place; then you wouldn't be having to pay this double duty''. That SED cannot produce enough to satisfy the market and that they virtually refuse to sell to private terminal users makes no difference.

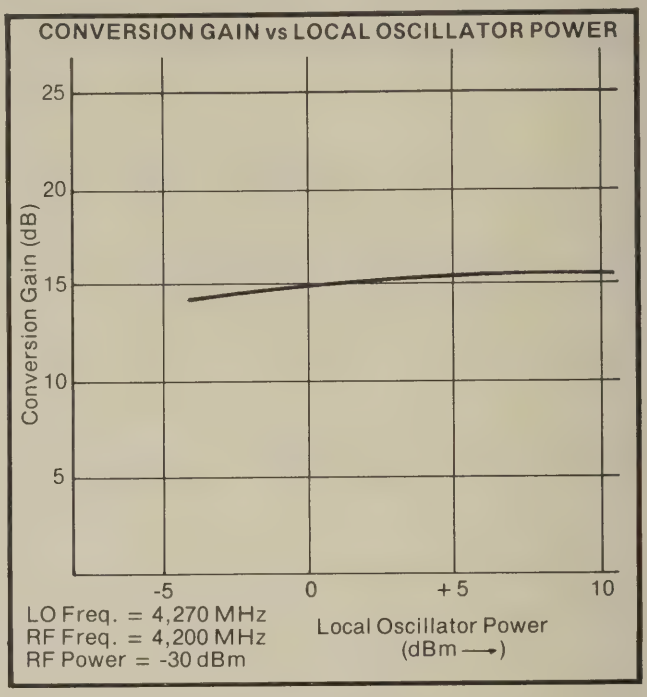
It is all simply more red tape created by a bureaucracy as an effort to retard the growth of private terminals in Canada. What's a law abiding Canadian to do? Certainly he is breaking at least the policy if not the law when he sets out to view US satellite signals. Then he is forced by the idiocy of the bureaucracy to become an equipment smuggler when his non-commissioned private terminal breaks down and he needs some expert factory repair to get it operating again.

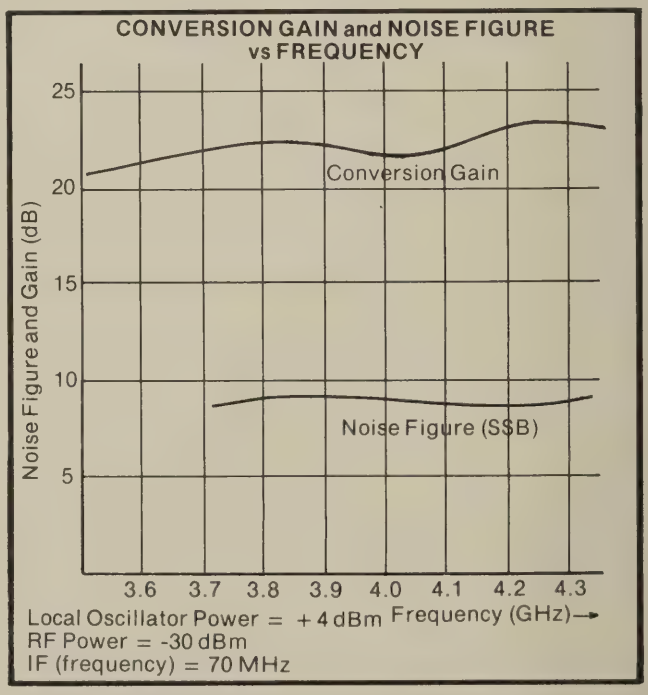
For every action they say there is an equivalent reaction. A pity it is that the Canadians had the foresight to start the domestic satellite service evolution and then having started it could find no way to control what they began. A double pity that Canada has chosen to 'fight back' what they apparently cannot control by indulging in petty bureaucratic red tape war manuevers which only force their own people to adopt yet more illegal tactics to maintain an even keel.

It is with this bureaucratic pattern in mind that we re-draw your attention to this month's cover. Created and conceived by the 'with-it' wife and partner of US satellite pioneer Tay Howard, **Annie Howard says it all** in a simple photograph. One Mounty, ticket book in hand, astride his trusted steed writing out a summons for the hapless owner of a private TVRO terminal. The crime? **Watching television!**

COOP'S SATELLITE DIGEST (Technology Section) is published monthly by Robert B. and Susan T. Cooper doing business as Satellite Television Technology (Ltd.), P.O. Box G, Arcadia, OK 73007 (USA); 405-396-2574. **CSD** is not affiliated with any satellite programming distributor, hardware (equipment) manufacturer or distributor nor satellite systems operator. STT sponsors the Satellite Private Terminal Seminars (SPTS) held three times per year and does produce and distribute 'learning' materials and 'how-to-do-it' manuals relating to the development of the low-cost satellite TV receiving system industry. Subscription fee is $50 (US funds) in advance Canada, US, Mexico; $75 (US funds) elsewhere. Copyright 1980 by Robert B. and Susan T. Cooper.

SINGLE CONVERSION APPROACH # ONE





There is no question that the world of 4 GHz is different from say the worlds in the VHF region and many otherwise experienced technicians and engineers find themselves groping in the dark a bit when they set out to construct their first active working, 4 GHz range circuit.

Norman Gillaspie went through this learning curve on his own more than a year ago, starting with the popular Howard and Coleman manuals, and slowly in his mind a system evolved which he felt suited his needs. Subsequently his system has been made available (as circuit boards and parts) to others. This report details his single conversion, high quality front end that will get you from 3.7/4.2 GHz down to 70 MHz in a hurry with good efficiency and outstanding performance. Coupled with other material in this issue of CSD, you may decide that this is a good way to go for either a tuneable single conversion TVRO or a low cost ARO (audio receive only) terminal.

Gillaspie's initial incentive for this project came from the long lead time associated with obtaining the Vari-L DBM500 mixer device. His answer was to create a stripline mixer that requires no tuning with the following specifications:

1] Input 3.7 to 4.2 GHz, flat to + /-1 dB

2] Output at a center frequency of 70 MHz (plus or minus 15 MHz) with a gain variation of no more than + /-0.5 dB

3] Total conversion gain (the system includes a 70 MHz IF) of 20 dB minimum

The particular Gillaspie Stripline Mixer described here has on-board provision for 'snapping in' an Avantek 8360 VCO (local oscillator) although an off-board VCO could be used and coupled in with an SMA fitting or hard wired with coaxial cable.

The Stripline circuit is constructed on Diclad 527 Teflon material (on .031 thick dielectric with 1 ounce copper on both sides) and **no substitution** of this material is recommended unless the builder is prepared to make stripline adjustments to 'compensate' for the differences in board dielectric constants.

There are three circuits on the board; a mixer, an oscillator and a 30 dB gain (IF) block. Looking at the mixer portion first (see circuit board prints here):

1) **Mixer**- The printed circuit line marked RF is your connection from the LNA to the mixer. An SMA fitting is soldered to the **bottom** of the board (remember this is to be double sided board) as well as the top. The signal is connected to a 1½ wavelength line which is designed to **cancel** the LO signal at the input and output ports and re-enforcing the signal at the mixer diode ports. The twin diode mixers and their placement around the ring are the other two ports. Notice the 'boomerang-shaped' twin inductors inside the ring; we have a 4 GHz low pass filter here.

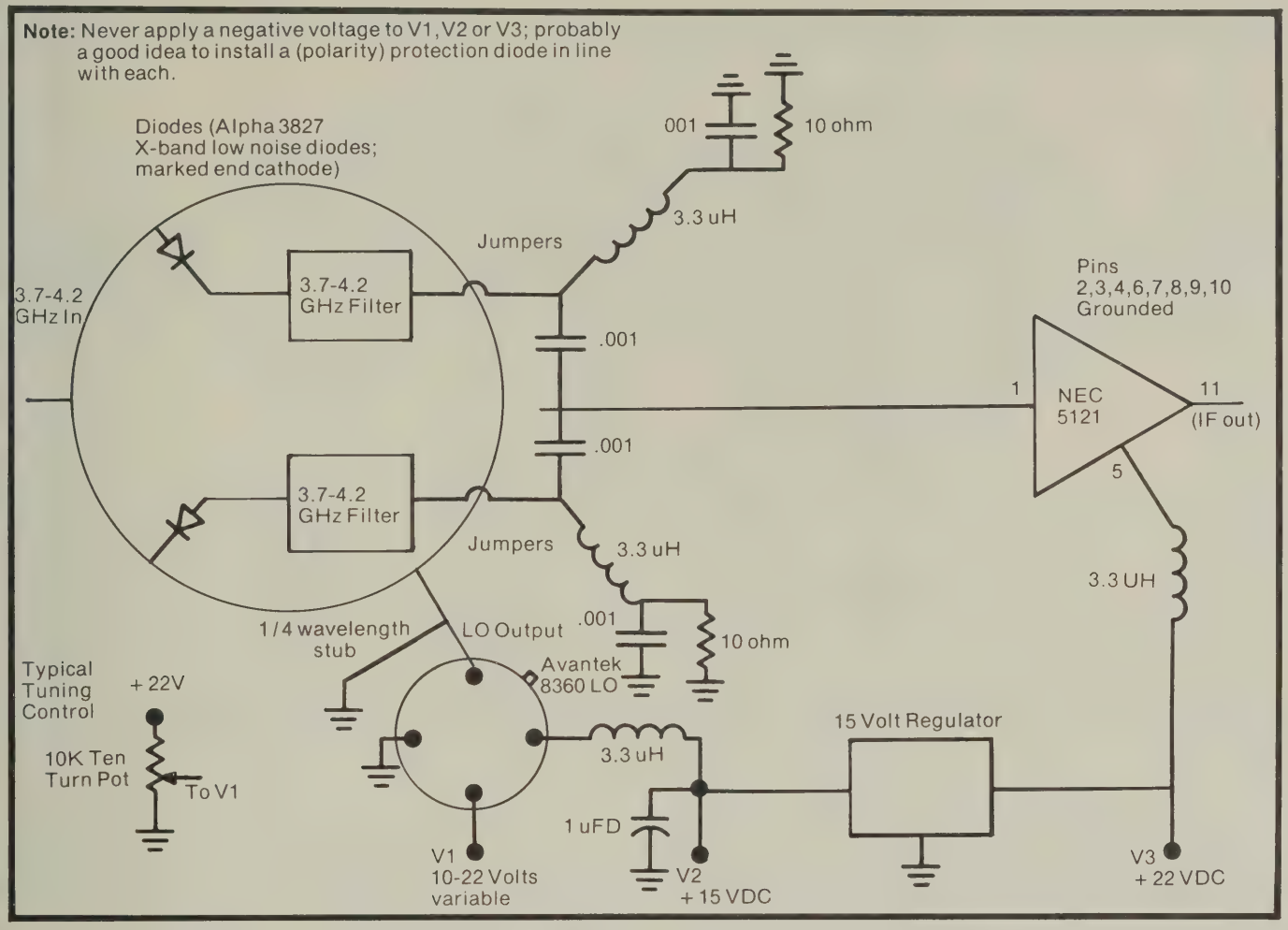
Also note the thinner etched inductors which lead to a pair of pads that couple through wire jumpers to the output line. This line combines the output from both diodes. Also attached on this line is a 3.3 uH choke in series with a .001 UFD capacitor paralleled by a 10 ohm resistor. This network forms a low pass filter producing a convenient test point to determine if the LO is working or whether you have blown a diode.

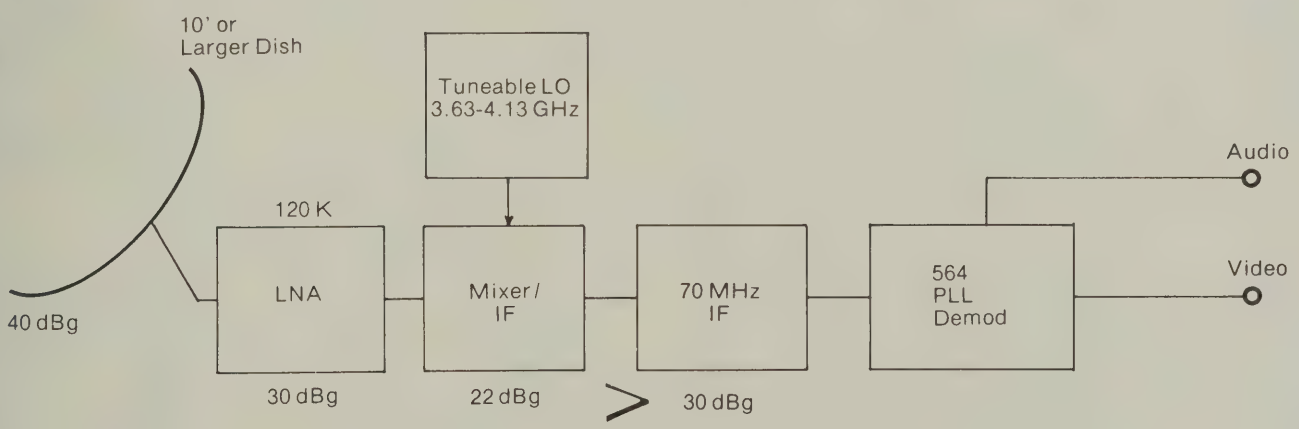
Local oscillator injection comes into the classic rat-race ring via the remaining connection marked LO. This line has a ¼ wavelength line attached to it which shorts to the ground plane on the bottom of the board. This is the DC return for the mixer diodes.

The recommended VCO is the Avantek 8360 which requires a 15 VDC supply for oscillator operation plus a 11 to

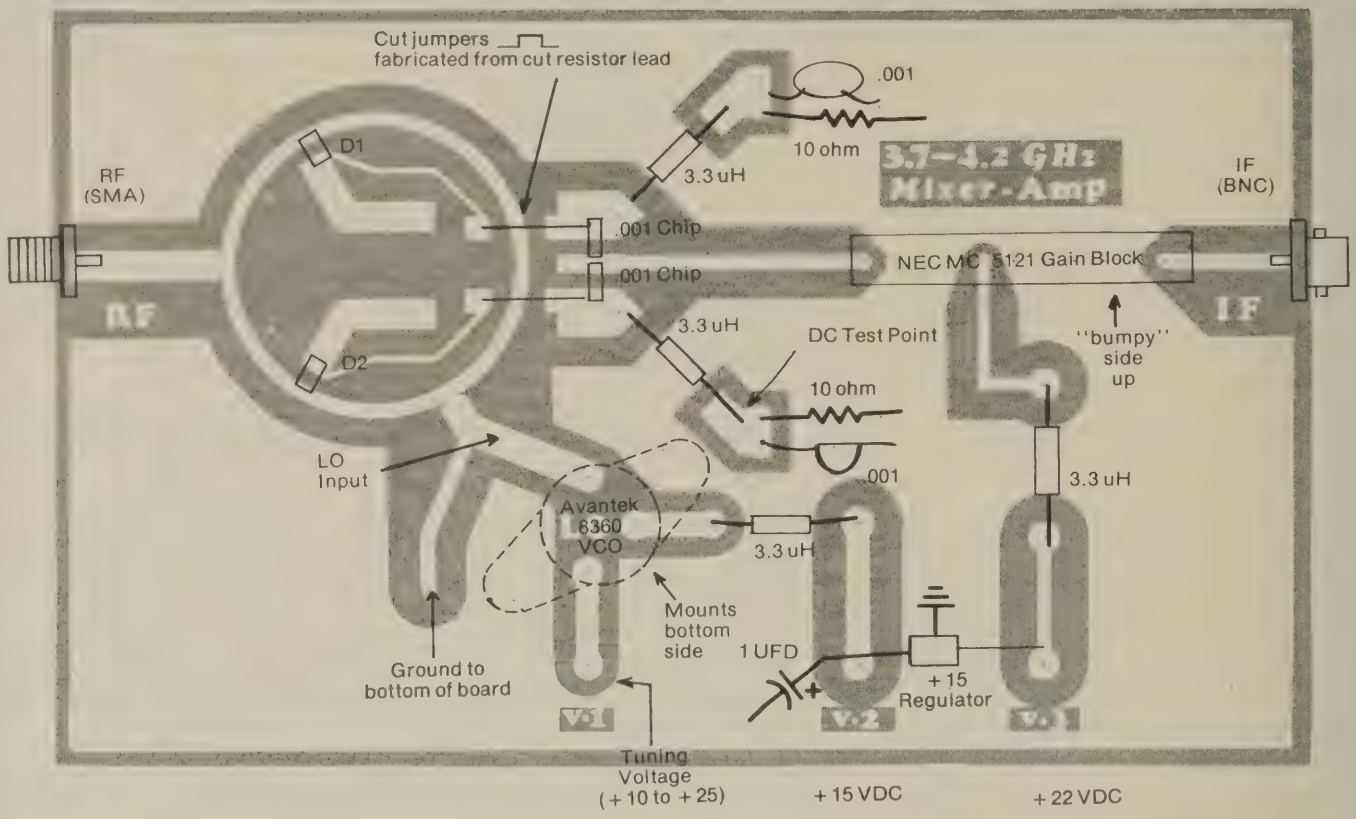
Prepared from Material Submitted by:

Norman Gillaspie
2225 Sharon Rd., #224
Menlo Park, CA 94025



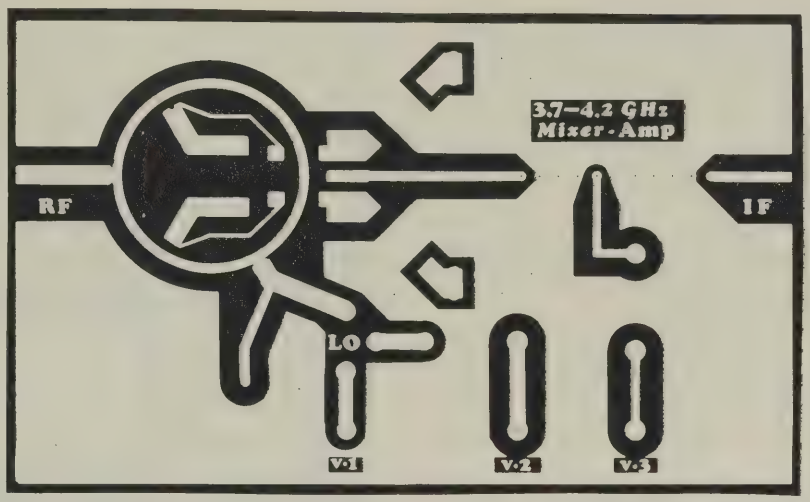


GILLASPIE RECOMMENDED SINGLE CONVERSION SYSTEM



22.0 volt DC variable source for tuning of the VCO/LO. The only precaution in using the 8360 is [1]allow plenty of lead time when you order (they can run over 12 weeks!) and [2]**don't ever** (ever!) apply a negative voltage to any of the 8360 terminals.

The output stage of this sytem is a 75 ohm input/output 'gain block' which has 75 ohm input and outputs and requires a +22 VDC supply. There is some gain reduction (but not astronomical) when the gain is reduced to +15 VDC, or the package could run off a 24 VDC line with appropriate dropping resistors. The output is to the extreme right of the board and a



connection similar to the input utilizing either an SMA or BNC is required. Operation of the unit is characterized here in graph form.

Construction

Follow the parts layout and the photograph; note diode placement and polarity. All parts mount to the top of the special board with the exception of the LO source which mounts to the bottom. If you wish the VTO could be **soldered** to the ground plane of the board rather than using mounting hardware although this would increase the problems associated with replacement and heat to the case is to be avoided for prolonged periods of time. The NEC gain block device should be mounted with the 'bumpy' side towards you, the input side to the left and the output to the right. All unused holes are soldered through with short pieces of wire (such as off of the resistor/capacitor leads) connecting top and bottom of the ground plane together. In mounting the balance of the parts, simply follow the layout given here.

Operation

Apply the supply voltages (V2 and V3 on board) and adjust the tuning voltage applied to the 8360 (V1) to approximately 17 VDC. This should place you in **mid-band** near 3950 MHz. As per the system block diagram, you would have around 52 dB of gain (electronic; plus 40 dB passive antenna gain) up to the output of this mixer portion of the system. To go the rest of the way you need to pass from the output of this board into an appropriate 20 to 30 MHz wide IF passband filter and then into an additional IF gain stage (30 dB or so recommended). This should get you into the right ballpark to hit a phase lock loop demodulator with around 0 dBm.

For the record, in a single conversion receiver a local oscillator (the 8360 or suitable substitute) and a mixer (the Alpha diodes in the rat race scheme) receive the selected satellite transponder (found by varying the 11-22 volt tuning voltage on the 8360) and convert it down to the 70 MHz IF. All single conversion mixers have some degree of image problems (see 'Image Rejection Single Conversion Mixer', this issue of **CSD**) and a phase lock loop demod minimizes (but does not eliminate) this image effect. If the downconverter is properly designed as this one is, there should be no detectable amount of signal distortion in the conversion process.

One of the more appealing parts of this package is that because the IF output range is 'unfiltered' at the output of this portion of receiver design, and because the costs (the Avantek 8360 aside) are rather minimal, the downconverter-tuner could be used to drive directly into a higher IF in the 88-100 MHz region utilizing a standard FM tuner/receiver as an IF. This would allow you to recover audio-only transmissions where they are transmitted as descrete FM carriers via the bird for a minimal investment in the receiver (see separate report this issue of **CSD**).

SINGLE CONVERSION MIXER - Parts List

The following parts are required for construction of the Gillaspie single conversion downconverter plus pre-IF amp:

a) **Gain Block**, NEC MC5121 (approximately $13.00)
b) **Alpha diodes** (2 required), D5827 (approximately $25.00)
c) **Chokes**, 3.3 uH (4 required)
d) **Ceramic caps** (2 required, .001 disc)
e) **Chip** or miniature ceramic caps (2 required), .001
f) **Resistors** (2 required, ten ohms)
g) **Printed Circuit Board** (1 required), available from Norman Gillaspie, 2225 Sharon Rd., #224, Menlo Park, CA 94025

The VCO is the Avantek 8360 and it is currently priced in the $115 range (Avantek, 3175 Bowers Ave., Santa Clara, CA 95051; 408/249-0700). The diodes are available from Alpha Industries at 617/935-5150.

Gillaspie will provide this special circuit board for $35 (drilled and plated) or all parts less the Avantek VCO (including the board) for $75. He also has a two-stage Birkill LNA board (with 2.2, 4.7 and 1000 pF chip caps); anyone ordering the single conversion downconverter board detailed in this report during June will also receive the two-stage LNA board as a 'free' bonus. Gillaspie is scheduled to appear on the SPTS '80 San Jose technical program so those who are looking for hard answers to LNA and down converter problems should start preparing their question list now!

SINGLE CONVERSION APPROACH # TWO

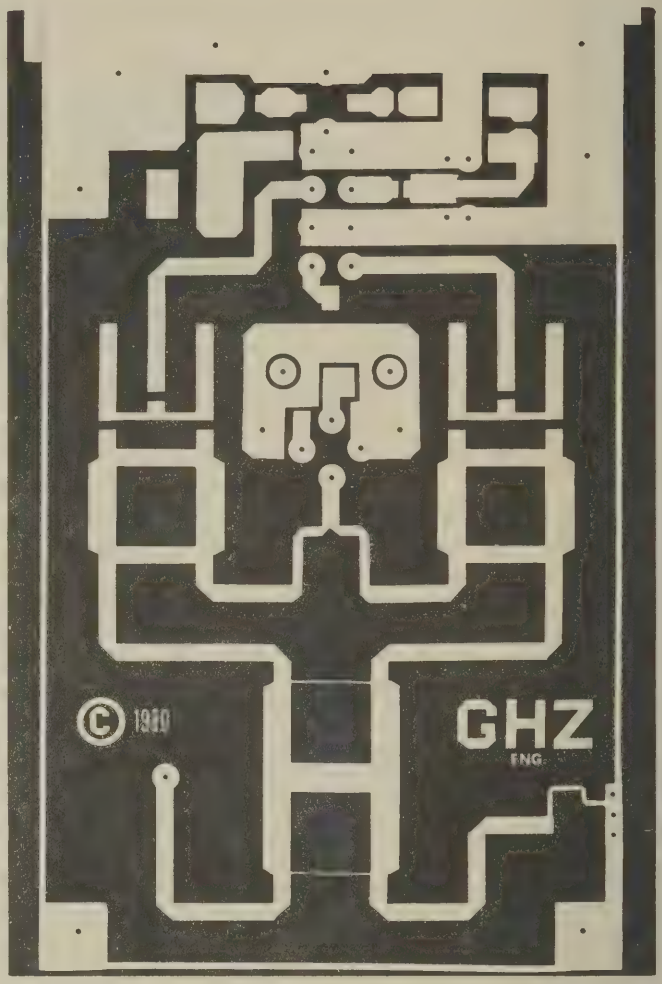
One of the primary disadvantages for the single conversion (TVRO) receiver operating in the 3.7 to 4.2 GHz

Prepared from material submitted by:
Davd Barker
GHZ Engineering
P. O. Box 33205
Phoenix, AZ 85067

downlink range is the noise present in the image 'response' frequency range. As **CSD** noted in the April issue (see Technical Correspondence, page T15) a tracking filter might be employed to remove the 140 MHz offset image; but such filters are very expensive to construct and more tedious to implement and tune-up. A better approach, in that it is simpler, is to design the downconverter to utilize an image rejection mixer. This is the approach taken by GHZ Engineering's 'Superverter' package.

The Superverter is an image reject mixer which is intended to provide the major part of the simple (as in low cost) TVRO receiver. The unit is powered by a single +15 VDC supply (at around 80 mA) and image rejection across the full band is at least 10 dB (worst case).

Now 10 dB may not sound as if it would be sufficient rejection of the unwanted image signals to be a worthwhile effort. It turns out that for most low-cost applications it is quite enough rejection. Because an image 140 MHz removed from the desired transponder LO is always going to be cross



polarized (SATCOM/COMSTAR; i.e. transponder 12 center frequency is 3940 MHz while 70 MHz **below the LO** operating at 3800 MHz is transponder 5) **or between** transponders (WESTAR/ANIK; i.e. transponder 8 center frequency 4000 MHz, LO at 3730 MHz, lower image at 3660 which falls between transponders 4 and 5). In the case of SATCOM and COMSTAR, the cross polarization difference is itself in excess of 20 dB worst case and more typically 25 dB. In the case of linear-horizontal birds the image falls squarely in between transponders where there is very little modulation present. Any that is present is going to be down far more than 30 dB.The concern then is with the 'noise' present, not the RF energy.

Rejection of 10 dB of noise typically works out so rejection of almost as much noise as the typical Carrier to Noise ratio (C + N to N) runs on the deisred transponder; a typical small terminal system runs a C + N to N in the 11-13 dB range maximum. Therefore while not every bit of additive noise may be rejected in an image rejection mixer, the amount remaining contributes an insignificant degradation (approximately 1/10th dB) to the desired transponder C + N to N.

(It should also be noted that when two or more receivers are to be utilized with a single LNA and one or both of the receivers are single conversion the presence of the receiver(s) LO(s) leaking backwards into the LNA can cause very severe problems. The solution to this is to install isolators on the input to the receiver(s) and use proper hybrid power splitters to drive the separate receivers. This warning is primarily applicable to **multiple receiver installations** and should **not** deter single receiver systems from seriously considering this approach.)

In the GHZ Superverter the input impedance is 50 ohms through an SMA connector. The input line from the LNA will typically be very short since one of the potential advantages of this approach is that the downconversion portion of the

AVANTEK IN STOCK

MODEL 4205 LOW NOISE AMPLIFIER (LNA)
- 50 dB GAIN — 3.7-4.2 GHz
- 1.5 dB MAX NOISE FIGURE (120°K)
- DC POWERED UP CENTER COAX CONDUCTOR

PRICE **$1100.00**

MODEL DCB-42 OPTIONAL DC BLOCK
- DC VOLTAGE BLOCK AT RECEIVER END

PRICE **$50.00**

MODEL VTO-8060 VARACTOR TUNED OSCILLATOR
- 600-1000 MHz FREQ. RANGE
- 3-40 VDC TUNING VOLTAGE PRICE **$150.00**

DELSTAR SYSTEMS
DISTRIBUTORS OF EARTH SATELLITE SYSTEMS/EQUIPMENT
9630 Clarewood Suite A-5 • Houston, Tx. 77036 • 713/776-0542

Alaska Microwave Labs

4338 E. 5TH STREET
ANCHORAGE, ALASKA 99504
(907) 338-0340

RF - IF I.C. AMP

MWA-110	.1 TO 400 MC 14 DB GAIN TYP	
3 TERMINAL IN, OUT, GROUND		$7.75

DUAL GATE MOSFET

RCA 40673	$ 1.50

CHIP CAPACITORS

10,47,100-1000 Pf	$ .50

HOT CARRIER DIODES

MBD 101	UHF – MICROWAVE	$ 1.50
ND 4131	4 GHZ NF- 5.75 DB	$13.25
AMW	4 GHZ NF- 6.5 DB	$ 2.00

FEED-THRU CAPACITORS

500 Pf	$ .50

TRANSISTORS

MRF 901	FT 4.5 GHZ	$ 3.00
BRF 90	FT 5.0 GHZ	$ 3.00
NEC 02137	FT 4.5 GHZ	$ 3.25
NEC 64535	FT 8.5 GHZ	$ 15.00

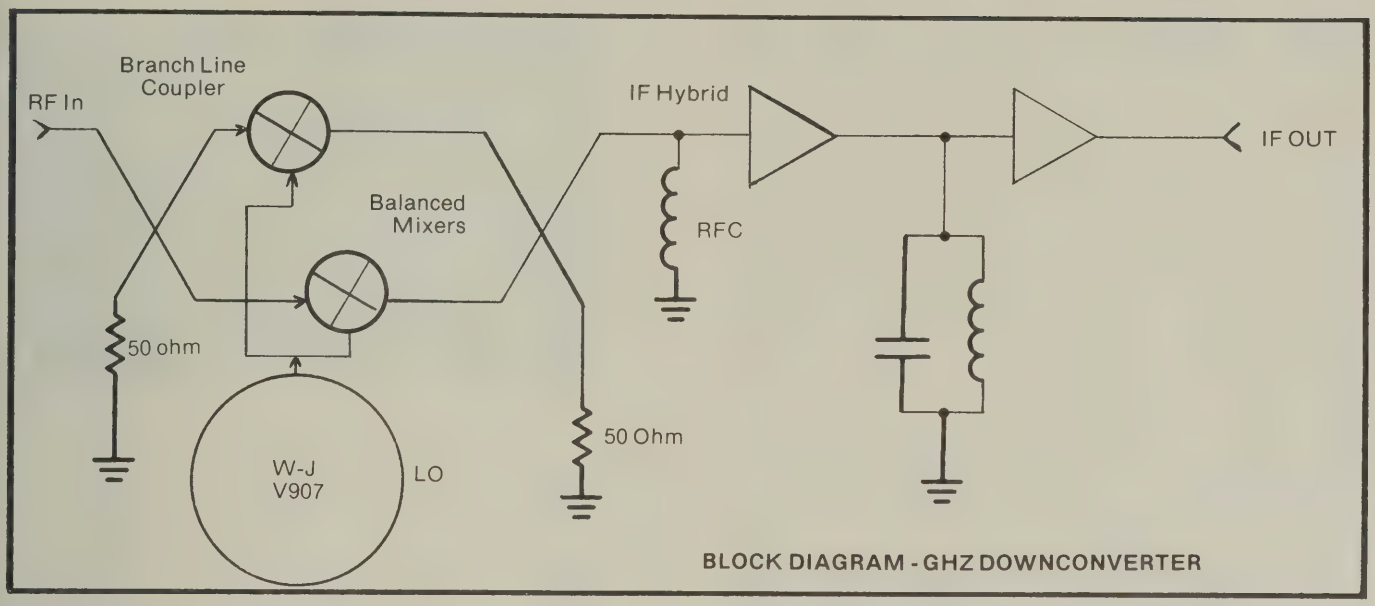
TEFLON CIRCUIT BOARD

APPROX. 3.5" x 5.0" x .010	$ 5.00
APPROX. 3.5" x 5.0" x 0.312	$ 6.00

COAX CONNECTORS

BNC CHASSIS MOUNT SQUARE FLANGE	$1.87
BNC PLUG FOR RG-58	$1.87
SMA CHASSIS MOUNT SQUARE FLANGE	$5.60
SMA PLUG FOR RG-58	$6.07
SMA PLUG FOR RG-174	$6.07
TYPE N CHASSIS MOUNT SQUARE FLANGE	$3.20
TYPE N PLUG FOR RG-9/RG-8	$3.69

OPEN AT 8PM EST
CLOSED 8PM PST
ORDERS ARE POSTAGE PAID
COD—VISA—MASTERCHARGE



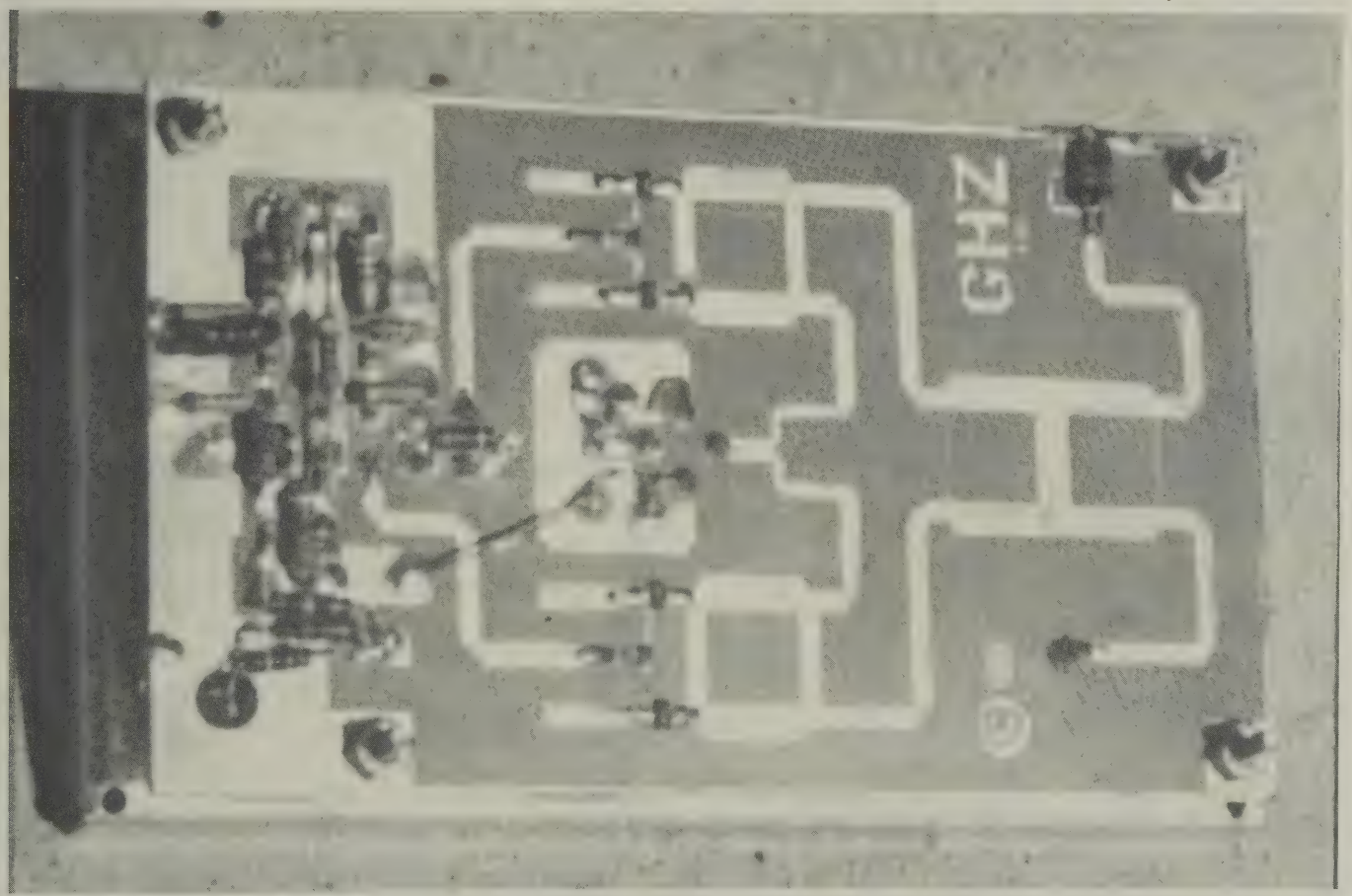
BLOCK DIAGRAM - GHZ DOWNCONVERTER

package can be located outdoors at the antenna (feed). If the installation wishes the Superverter indoors it would simply be at the indoor end of the (normal) downline from the LNA. The Superverter has two stages of IF gain following the image rejection mixer. The total package gain is around 25 dB.

The LO in the Superverter is a Watkins-Johnson V901 or a W-J V907 device. The required tuning voltage can be sourced from a + 15 VDC supply through an AFC circuit in the receiver. Without an AFC, a 2K pot in series with the + 15 VDC line will allow tuning of the LO.

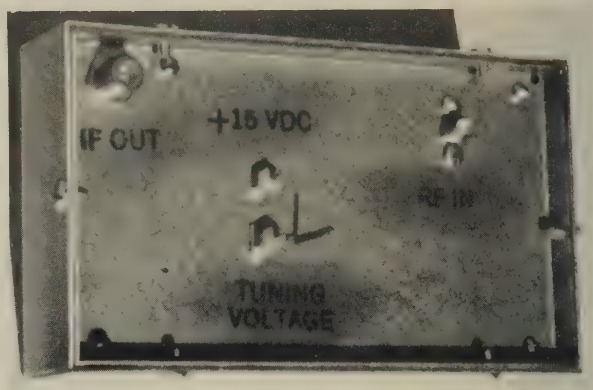
The mixer approach is the same one finds in a phasing type of single sideband exciter. The RF input signal is split into a pair of equal signals; each 90 degrees out of phase with the other. These signals are mixed in a pair of single balanced mixers with the LO source from the W-J unit. The LO is fed in phase to the pair of mixers. As you can determine from the photo and PC board layout appearing here, the mixers and power splitters are etched on a (glass Teflon) circuit board.

The IF signals, one from each mixer, are combined in an IF hybrid coupler from Mini-Circuits. The IF hybrid also has 90



degrees of phase shift between ports and the two signals appear at the output of the hybrid. One of these signals is the 'desired' signal while the other is the undesired image. The desired signal is filtered and amplified while the image is 'terminated'.

One low-Q (i.e. broad selectivity) circuit is in the IF to limit the noise bandwidth going to the second stage of the IF amp. The output level from the package is a function of the LNA gain, cable loss and antenna size. **With a 50 dB gain LNA** in front of the package, a PLL demodulator **could be** connected directly to the output of the Superverter. In Barker's personal system with a 50 dBg LNA driving 25 feet of high-loss RG-8 he has -20 dBm on most FI transponders in Arizona. Alternately with a 30 dBg LNA the unit can be mounted at the antenna and 75 ohm cable run to a bandpass filter and IF amp (the downfeed being at the 70 MHz IF).



TYPICAL SUPERVERTER DATA

	Minimum	Maximum	Typical
Image Rejection	10 dB		15 dB
Gain	22 dB	30 dB	25 dB
Return Loss Input	10 dB		15 dB
Return Loss Output	12 dB		20 dB
Noise Figure		13 dB	10 dB
LO Tuning Voltage	0 VDC	20 VDC	1-8 VDC

The noise contribution from the unwanted image (response) using the Superverter image-rejection approach will typically be 1/10th dB.

The output of the Superverter is 40 MHz wide (at the 3 dB points) and centered at 70 MHz. With 25 dB of IF gain **at 70 MHz** several hundred feet of low-cost RG-59 cable could be run from the remote mounted downconverter to the balance of the IF and a demodulator inside. The 'light filtering' in the unit is really not adequate for single channel processing nor was it intended to be; a 70 MHz 25-30 MHz standard bandpass filter should be installed in the IF segment that follows the Superverter.

The Superverter circuit board is mounted in a container (3'' x 5-1/2'' x 4-1/4''). When mounted outside the box is suspended with the cable connectors down. It is suggested that power be left on thereby producing some heat within the box to prevent moisture buildup inside of the container. For difficult climates additional box weatherproofing would be required. For example, for very cold or damp climates a 'load' resistor inside the box would supply additional heat. When the unit is used in conjunction with a 50 dBg LNA probably the best location for the Superverter is inside.

A PRELIMINARY LOOK AT AROs

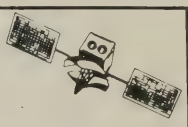
SLOW - TVRO System Delivery ?

ANXIOUS to get your earth station up and running? Tired of getting the run around on receiver and LNA delivery? Check with AVCOM!

AVCOM's field proven PSR-3 receiver is in full production. With remote tuning, dual video outputs, our exclusive Clamp-Sync and Scan-Tune, the PSR-3 is the finest TVRO receiver on the market. Combine this high-quality receiver with our in-house-stock of high quality 120°K (50 dB) LNAs and you have the best private terminal package available today. PLUS - **we deliver radios and LNAs**...not promises! YES - AVCOM always has room for one or two more qualified dealers and distributors.

AVCOM of Virginia, Inc. (804)320-4439
10139 Apache Road, Richmond, VA 23235

The
8-BALL



12-FOOT SPHERICAL

SATELLITE TELEVISION ANTENNA KIT

LIST PRICE: **$750.00**

- *Rugged steel frame*
- *Aluminum screen reflector surface*
- *Durable redwood strips support reflector screen*
- *Easy to assemble*
- *Easy to align*
- *Receive signals from several satellites*
- *Very low cost*

VIDIARK ELECTRONICS DEVELOPMENT CO.
P. O. Box 57
Salem, Arkansas 72576
Phone: 501-895-3167

HIDDEN AWAY

The 40 MHz wide transponder which brings you a single channel of video plus one or two or three aural sub-carriers is also capable of handling (in place of the video) more than 900 (one way) voice/data channels utilizing a technique called frequency division multiplexing (FDM-fm),or, 500 (one way) single channel per carrier /SCPC signals (fm-FDMA). Or the transponder could handle 60 megabits per second of digital data.

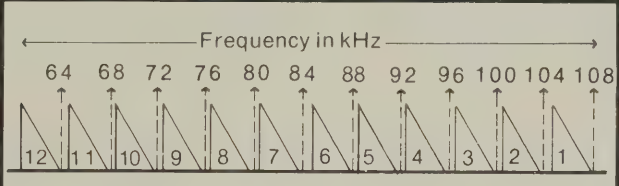
As you tune through the transponders, even when you see **no video**, chances are that as you tune through what appears to be a 'blank' (i.e. no video present) transponder there are lots of communication channels there none the less. On WESTAR and SATCOM birds, and on COMSTAR D2 and D3 there is almost no such thing as a transponder with **nothing** on it.

The FDM-fm signals are sent as groups or packages of channels. Typically one transponder is utilized on a bird for east-west transmission paths (i.e. New York to Los Angeles) while a second transponder on the same bird is utilized for the return path (i.e. Los Angeles to New York). In the case of telephone-type voice communications you would find 1/2 of the conversation on each of the two transponders. Uplink sites bundle or combine multiple voice or narrow band data sources together and transmit these bundles or groups to the bird. At the receive sites whole segments or groups are processed together up to the point where they are split apart into the individual channels for terrestrial delivery to the proper receiving point.

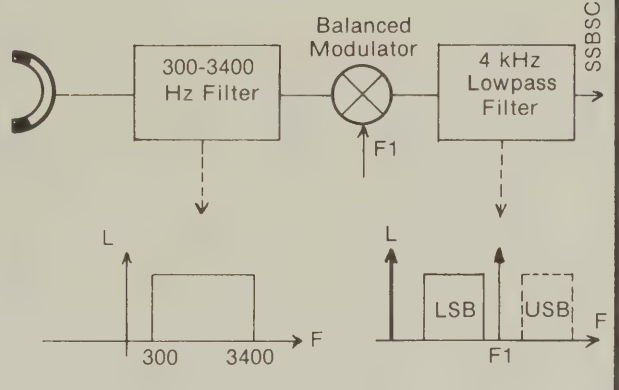
The SCPC / fm-FDMA signals are handled going to the bird as descrete uplink signals; a site may have just a single audio/data channel winging towards the bird utilizing a relatively low power (i.e. 700 watt) uplink transmitter into a relatively small (i.e. 4.5 meter) uplink antenna. A single transponder may have dozens (or even hundreds) of separate or descrete SCPC channels passing through it; each under the separate control of its uplink operator.

Because the SCPC approach involves the transmission of descrete carriers or signals the uplink transmitter can be portable and be moved as required by the service. In effect, the small uplink station is boresighted to the bird, a check is made to insure that the selected uplink frequency is 'clear' and the station starts talking. The satellite treats the uplink signal just as it would any other; turning it around and sending it back down again. The primary advantage to SCPC is that the station can be relatively simple, which means less expensive, and it can be moved about as needed.

Alternately the FDM-fm uplinking is more appropriate at a major center where dozens of separate signal sources can be converged to an uplink station, combined utilizing the multiplexing techniques, and then sent as a group onto the bird. The same efficiency of scale applies at the downlink sites; if a group of 12 users, all communicating between Los Angeles and New York say are combined into a basic 'Group' for uplink processing, at the downlink site the same Group is received and processed as a group, without demodulation to baseband and then carried via terrestrial circuits into the heart of the city where individual leased or radio circuit lines finally connect the then demodulated signals to the appropriate points of



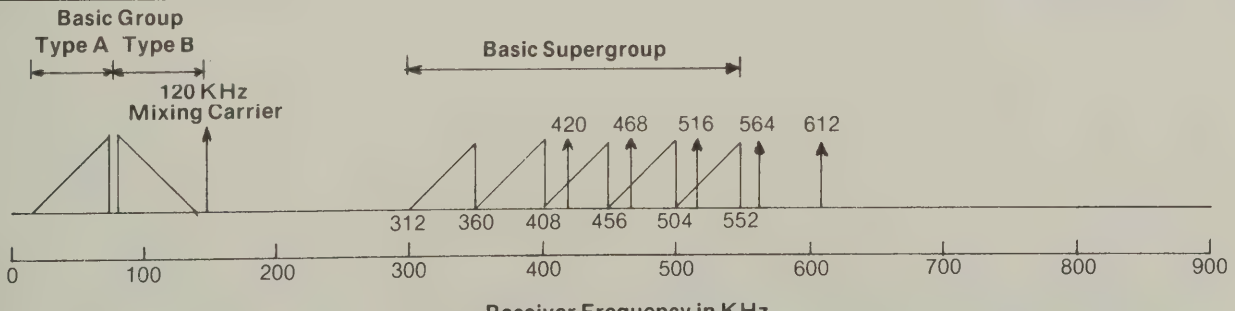
Basic Group of 12 "4 KHz" Voice Grade Channels in 64 to 108 KHz Range; Each Channel Modulates Carrier Separately. (Type B Group)



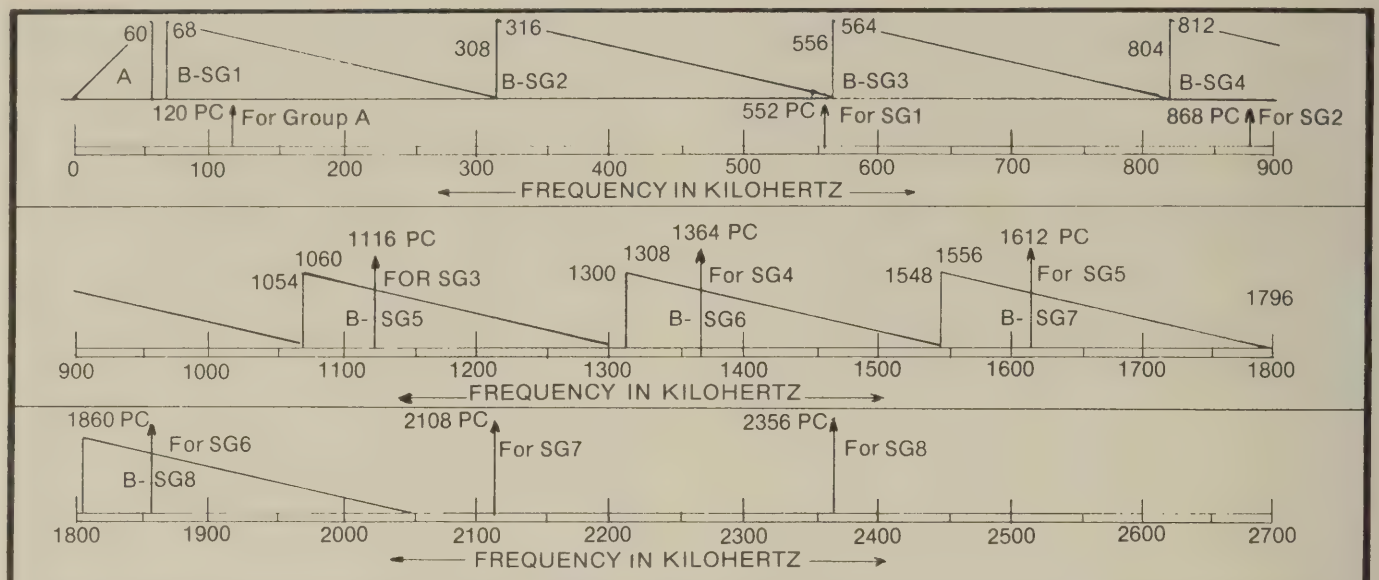
LOWER SIDEBAND AUDIO SIGNAL IS GENERATED IN BALANCED MIXER AFTER 300-3400 Hz PROCESSING

communication. In the FDM-fm system the satellite operator acts like a telephone-company-in-the-sky routing 'packages' of communication channels around and about. In the fm-FDMA approach, each voice or data channel requires custom patching or connection to insure that once the SCPC signal is into the bird there is somebody on the opposite (terrestrial) end to hear it and talk with it.

The typical voice or low grade data channel is 3.1 kHz (3100 Hz) wide **as shown here**. A bandpass filter cuts off all information below 300 Hz and above 3400 Hz leaving intact the normally most useful voice communications spectrum. This bandwidth is then applied to a balanced modulator device which (with appropriate filtering) results in a lower sideband (SSB) signal. After being converted to a lower sideband **audio**


Basic Group
Type A Type B
120 KHz
Mixing Carrier
Basic Supergroup
420 468 516 564 612
312 360 408 456 504 552
0 100 200 300 400 500 600 700 800 900
Receiver Frequency in KHz

GROUPS vs SUPERGROUPS



BASIC BASEBAND SPECTRUM IN SSB FREQUENCY DIVISION MULTIPLEXING ON TYPICAL SATELLITE TRANSPONDER

signal the signal is mixed with a carrier (i.e. LO) in the 64 to 108 **kHz** region and this generates the first level 'RF' signal. Twelve such carriers with lower sideband (LSB) 'attached' are considered a basic **Group**. The 12 carrier Group becomes the basis then for dispatching them as a **package** to a single intended receiving terminal. They will remain together, in the 'RF' region between 64 and 108 kHz, until they near their final individual destinations. Demodulation back to the basic audio range (300-3400 Hz) will only take place when the actual delivery circuits are approaching.

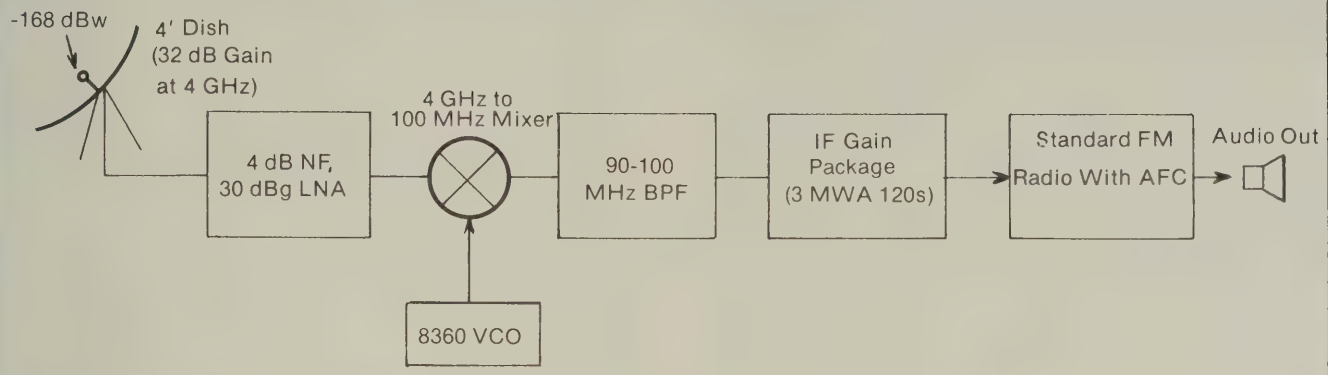
The 12 channel package is a convenient way to get 'packets' around and about but it is nothing more than a basic building block. However with as much satellite relayed traffic as there is these days it becomes necessary to build upon the basic Group and for this there is the **Supergroup**; a combination of **five** basic Groups. If a basic Group contains 12 separate carriers a Supergroup will contain 60. Again, we have a 'package' of channels which can be processed all together and kept intact up to a point of final destination and delivery. But sometimes 60 circuits between two major centers is not enough so there must be something larger; it is the **Mastergroup**; a combination of five Supergroups. A Mastergroup has the capacity for 300 circuits or channels between any two locations. Yes, it can go on from there but at the present stage of growth Mastergroups seem capable of handling the needs between even the two largest message centers; Los Angeles and New York.

Now since a single transponder may be utilized for 900 or more separate FDM-fm voice-grade channels, and since it appears that no single message center such as New York is commonly utilizing more than the 300-channel Mastergroup packet, that suggests (quite correctly) that **within a transponder** there is some method of frequency assignment employed so that several uplink centers (such as New York, Atlanta, Chicago) can **share** the same transponder. It is done by stacking all of the westward bound channels on one transponder, assigning each uplink center **a portion of the transponder** as a 'block' and all of the eastward bound traffic coming back from west coast centers such as Phoenix, Los Angeles and San Francisco blocks within a second transponder.

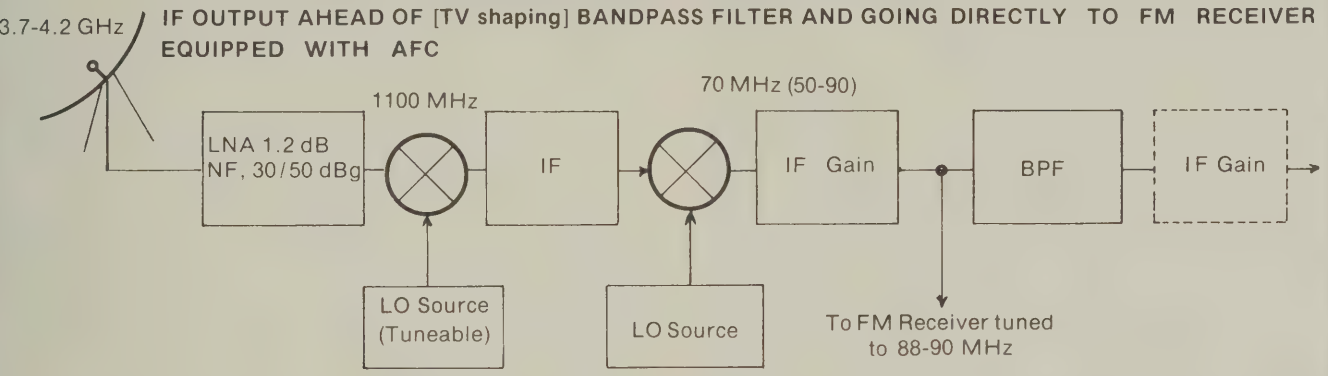
These assignments are handled by the satellite operator, they can (and are) varied from time to time as circuit (channel loading) demands change from one uplink site center to another.But - the basic on- satellite transponder configuration stays quite constant. However at any given point in time you are apt to find a mixture of FDM-fm and fm-FDMA signals within a given transponder. On the surface it sounds as if it might be very confusing.

While not all of the transponders in use for FDM-fm and fm-FDMA utilize the allocations scheme **shown here**, it is the most common format found. Basically you have a baseband (as in DC to some upper limit of your video amplifier processing stages in your receiver) output on your receiver. You have always thought of this as something that connects video to your monitor or as drive for your modulator. When you dial up a transponder that is **not** carrying video, but rather is carrying some form of voice and data, what you are really having coming out of the 'baseband' or 'video' spigot on the receiver is a miniature frequency spectrum that starts at DC and goes on up. And since the carriers occupying this 'spectrum' are typically lower sideband modulated (although there are some that are upper sideband modulated in the 12 to 60 kHz region), if you wish to demodulate these SSB signals you need to feed the baseband/video output to a suitable demodulator box. This can be any 'general coverage' (selectable) single sideband (communications) receiver.

Having connected the baseband/video output of the TVRO video receiver to the antenna-input jack on the SSB receiver you are ready to 'tune' the mini-spectrum looking for signals. What you will find (assuming you have dialed up a transponder that is not carrying video but is carrying audio/data) is a whole series of 'carriers' spaced almost precisely 4 kHz apart. Every little while you will find an odd-spaced (2 kHz separated) carrier; an LO mixing carrier. **Some** of the 4 kHz spaced carriers will be modulated; one side of a telephone circuit, half of an engineering intercom line between engineers and technicians associated with the satellite operations, perhaps an RTTY (radio teletype) channel, commercial network intercom channels, commercial radio network news feeds and a host of other 'narrow band data'. Most of this gets demodulated fully with the addition of the DC to 4 (+) MHz selectable sideband communications receiver. **RTTY channels however** are further 'modulated' and to make any sense out of them you'll have to go one further step and apply the demodulated audio from the sideband receiver to the input of a gadget called an 'RTTY Demodulator'. This box accepts the audio tones that make up the RTTY signal, translates them to either the Baudot or ASCII format as required and then drives yet the final box; a printer of some sort. With this additional equipment you can view on a CRT display or copy on a hard paper Teletype® machine the current AP or UPI newspaper or radio (they **are** different) news wire feeds, the latest cattle prices in Chicago or the latest gold prices in Zurich. It is all there, much of it 24 hours a day. In fact you can copy or read the full details of tomorrow's newspaper



BASIC LOW COST AUDIO-RECEIVE-ONLY [ARO] TERMIAL


TYPICAL TVRO TERMINAL CAN RECOVER NPR AUDIO ON WESTAR I, TRANSPONDER 2 BY TAKING IF OUTPUT AHEAD OF [TV shaping] BANDPASS FILTER AND GOING DIRECTLY TO FM RECEIVER EQUIPPED WITH AFC
3.7-4.2 GHz
LNA 1.2 dB
NF, 30/50 dBg
1100 MHz
IF
70 MHz (50-90)
IF Gain
BPF
IF Gain
LO Source
(Tuneable)
LO Source
To FM Receiver tuned
to 88-90 MHz

stories (national and international anyhow) in the evening before you go to bed if that turns you on!

If you have been bitten by the TVRO bug and had no knowledge that all of this 'other data' was available on the bird, it may be a little confusing at this point. Let's see what some of the typical questions might be:

1)**I understand that each TV signal has with it an audio sub-carrier and that this sub-carrier may be anyplace from around 5.5 to 7.5 MHz although it is typically on 6.2** (WESTAR) **or 6.6** (COMSTAR) **or 6.8** (SATCOM) **MHz. Are you saying that all of these hundreds of other audio and data and teletype etc. carriers are also there too?**

Yes, but not on the same transponder. They operate separate from the video modulated transponders.

2)**Can I connect the baseband output of my TVRO receiver to a general coverage communications receiver and tune in the sub-carrier range by tuning 5.5 to 7.5 MHz?**

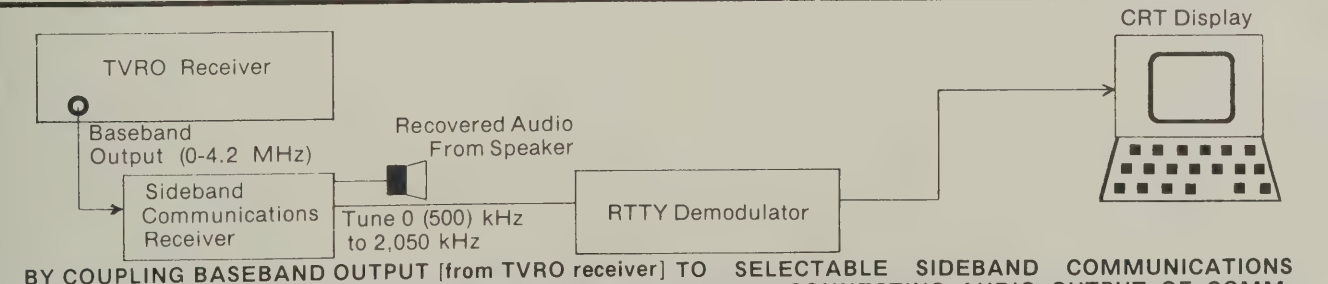
No, you cannot. These sub-carriers are FM (frequency) modulated whereas the other carriers we are discussing are actually AM single sideband (suppressed carrier).

3)**Then to tune in just the TV transponder sub-carriers I require a separate type of audio tuning system?**

Yes, and we'll be covering that in an early **CSD**. That's what all of those sub-carrier demodulator circuit boards and reports seen here in **CSD** are for.

4)**Can I use the TVRO receiver to simultaneously tune in both the audio that goes with the TV picture, as sound, plus other sub-carriers on the same transponder?**

Yes, you can. Some transponders are heavily loaded with sub-carriers. Number 21 on FI, for example, has its regular TV program audio on 6.8 MHz. On 5.8 MHz is something called The Disco Network on while the same transponder has Seeburg Background Music on 7.4 MHz. With a 'tuneable' sub-carrier detector added to your TVRO receiver you can independently



BY COUPLING BASEBAND OUTPUT [from TVRO receiver] TO SELECTABLE SIDEBAND COMMUNICATIONS RECEIVER, SSB-[FDM] AUDIO SIGNALS ARE RECOVERED. CONNECTING AUDIO OUTPUT OF COMMUNICATIONS RECEIVER TO RTTY DEMODULATOR PRODUCES NEWS/WIRE HARD [paper] OR SOFT [CRT] COPY DISPLAY.

tune in either of these (or both with two outboard sub-carrier detectors) in addition to enjoying the audio that goes with the transponder 21 video on the normal 6.8 MHz sub-carrier.

5)**Where does one find a listing of where all of these audio/data/RTTY channels are operating?**

A comprehensive list is currently being prepared by several groups and observers. The problem is compounded however by the fact that as transponder 'loading' (i.e. the total quantity of such channels in use) goes up and down the satellite operator has the ability to move whole Groups, Supergroups, and Master Groups around within a transponder or even off to another transponder. However most of the 24 hour per day services (such as the various radio network feeds and AP, UPI teletype service feeds on SATCOM FII transponder 16) are virtually static.

3.7-4.2 GHz SUPERVERTER

70 MHz IF, 40 MHz bandwidth with 25 dB gain. 10 dB noise figure, 10 dB (minimum) image rejection. Can mount at antenna with SMA input, 'F' output connectors.

Wired and tested, less power supply,..... $300.
IF Amp (70 MHz center) with 45 dB gain, 30 MHz bandwidth..... $ 80.
TVRO DEMOD (discriminator type) baseband output..... $100.

Terms: Payment with order, delivery 2-6 wks.

GHZ ENGINEERING
P.O.Box 33205 Phoenix,AZ 85067 (602/266-9749)

EARTH STATION EQUIPMENT

10 FOOT FIBERGLASS REFLECTOR

Includes feed mount and polarization rotator plus full plans for polar mount. **$875**

LOW NOISE AMPLIFIER

AVANTEK AWC-4205 120K, 50 dB gain, DC Power. Power supplied via R.F. Cable. D.C. Block included **$1099**

Also: Feeds, Power Splitters, Receivers, Distribution Amplifiers, Complete Systems Packages.

WE CAN DELIVER QUICKLY
Discounts available on package and quantity.

TRISTAR GENERAL, INC.
4810 Van Epps Road
Cleveland, Ohio 44131
Phone: (216) 459-8535

6)**Within the band 0 to 4 + MHz, is there some portion of it more commonly utilized than others?**

Yes, the lower 12 kHz or so of each Group or Supergroup or Master Group is dedicated to engineering intercom voice communications. That's where you will find the audio links between Vernon Valley and South Mountain (RCA's twin TT&C stations), for example. The lower Group A between 4 kHz and 60 kHz is seldom used for regular traffic. The radio network and teletype services are most commonly between the 800 kHz region and 1,600 kHz. Again, a listing is being compiled.

7)**Is this legal to tune-in?**

Good question. Section 605 certainly applies to the **private** message traffic, such as telephone calls. Whether it applies to UPI teletype feeds intended ultimately for public use or CBS Radio's Pacific coast network feed (etc.) is another matter. We make no legal judgements on this issue; merely share with you the basic engineering data to broaden your understanding of satellite communications as a whole.

8)**Is there one 'best' general coverage communications receiver for this application?**

Probably not. The new Kenwood R-1000 works very well as does a very old (20 plus year) Collins 51J4 (modified to add a SSB product detector). Many receivers sold in this class start their coverage around 500 kHz however and that means that the portion of the spectrum between 0 (DC) and 500 kHz would not be capable of being 'tuned in' on such a receiver.

9)**What would a whole lash-up cost to be able to receive the SSB signals and then feed the demodulated audio tones for teletype into the RTTY demodulator and either display it on a CRT or on a line printer?**

General coverage receivers sell in the $100 to $500 region, used to new (there are more expensive ones of course). The best bargains in RTTY demodulators are in the 'Ham' or amateur radio ranks; magazines such as **QST, CQ** and **73** usually have a fair listing of new and used RTTY demodulators and printers. Another option is to acquire an RTTY demodulator 'program' for say an Apple or TRS-80 computer. If you are already into computers such a 'program' can add RTTY copy for perhaps $50 or a tad more.

10)**What about slow-scan TV and facsimile?**

On transponder 6, on the 6.2 MHz sub-carrier, is the UPI 'Newstime' slow scan picture service plus accompanying (multiplexed) audio. This works by breaking a news wire photo down into a low data rate that takes perhaps 12-15 seconds to transmit a full video tube display. The picture 'paints across' and down the screen. this service sends tomorrow mornings newspaper photos with appropriate audio (i.e. an announcer reading a news story that goes with the photo) into your home about the same time as your local morning newspaper is 'going to bed' for the next day. The CATV firms spend upwards of $6,000 to process this 6.2 MHz sub-carrier sufficiently to feed it into a TV modulator. Hams have been doing that (using a slightly different technique) for around $500 in (new priced) gear for years. So far this has not been a very impressive service so there hasn't been much interest in doing it 'cheaply'.

11)**Since I already have a TVRO receiver, what can it cost me to be able to tune in the various sub-carrier [FM] services? And what and where are they?**

CSD has been listing them on the last page of the programming section for several months. On transponder 3 (WGN) we have Chicago's WFMT, a 24 hour per day 'fine music' (FM) station on 5.8 MHz. On transponder 6 (WTBS) we have UPI Slow Scan TV news plus multiplexed audio on 6.2 MHz and Easy Listening Music on 7.4 MHz. On transponder 21 (SPN) we have The Disco Network on 5.8 MHz and Seeburg Background Music on 7.4 MHz. All of these transponder operators have been saying for some months that they intend to 'load' up to a full capacity of sub-carriers (which **probably means** one each on 5.8, 6.2 and 7.4 plus possibly multiplexed signals up to a total of 5 on each) just as soon as the gear is available.

All you need is a sub-carrier detector (Rohner Machine Works and others have them available; see their ad in this issue of **CSD**) and an audio system with speaker. It could be put together for perhaps $25 to $35 if you had a decent box of parts.

SPTS '80 NEW EQUIPMENT PREVIEW!

TECHNOLOGY A-GO-GO!

Everywhere you turn at SPTS'80 in San Jose (July 4, 5 and 6) you will probably be tempted to scratch your head in wonderment. In the past pair of SPTS events we have been mindful of many suppliers working extra long hours to prepare new products for the 'show', each feeling the crush of one or more deadlines to have their equipment up and operational in time for the event.

BUT - in previous shows the push has been to get a production **prototype** 'up and running' in time for the show; this time around the message of Miami seems to be everyplace. What is that message? Don't show up with production prototypes...**show up with hardware in quantity** that can be bought and taken home directly from the show itself!

TRUE - there will be some production prototype equipment on display. That means new equipment that is not yet field proven, perhaps not yet into real world production. But the trend we see is for quantities of equipment to be on hand, ready for delivery; not just display.

MUCH of the equipment coming to San Jose will be new. It will not have been seen prior to the show except in limited private showings. Many of the suppliers at San Jose are new to the field and San Jose is a starting up point for their new equipment. Let's touch briefly on what some of the advance data suggests:

(1)**Receivers** - ICM will have a new generation version of their TV-4200 on hand. It will feature a plug-in remote control head that they say you can hardwire throughout the house to allow you to change transponders with the plug-in remote from virtually any place in the building. We told you about the twin-versions of the Tay Howard receiver last month (see May **CSD**, page T5). This group hopes to have a large quantity of receivers stacked up in their booth; and the projected $1300 price won't hurt sales any if they make it!

There is a new receiver coming from Rohner (7th and Elm, W. Liberty, Iowa 52776) which sounds very intriguing. The price is $1500. BUT - **that includes an LNA**. Hummm. First you have an antenna mounted LNA plus downconverter that takes you from 3.7/4.2 down to a high IF in the 400 to 900 MHz range. The LNA front-end is in the 120 degree K range, uses a pair of (NEC) GaAs-FETs and an active bi-polar mixer. Level out of this portion is +6 dBm. Inside you have the 'RCVR' (Rohner Converting Video Receiver) that further downconverts first to 190 MHz and then again down to 40 MHz. The audio sub-carrier is frequency-converted to 4.5 MHz (rather than being demodulated to baseband) while the video is demodulated and applied to an RF modulator. If that sounds like a lot of product for $1500, there is more. Words like synthesized and digital creep into the discussion. Oh yes, you will be able to use one 'Combo' box (the LNA/downconverter) at the antenna and run up to 12 separate 'RCVR' units (each to a different neighbor if you wish!) and everyone will have a full choice of any of the transponders on that particular polarization.

H&R expects to be the first to show a new package from 'commercial' supplier Microdyne; a receiver that mounts totally at the receiver with a six wire cable coming inside. This too is an LNA-plus-receiver package and we've heard reports that the 'list' price on the full package (including 12 foot antenna) from Microdyne will be in the $8,000 range. We'd like to tell you more but think we'd better wait until San Jose to do so.

SAT-TEC's new $995 receiver (see **CSD** for May, page T8) will, they promise, be available 'in quantity' at San Jose. Additionally, they hope to have a higher priced, frequency synthesized receiver with lots of bells an whistles on it; possibly in the $1800 region.

Several other exhibitors are promising new receivers; we'll see what transpires.

(2)**LNAs** - We don't expect any startling commercal revelations in this area at SPTS (if you overlook the Rohner

NEED PARTS...
Sat-tec's Got 'em!

70 MHz DEMODULATOR CARD

The Sat-tec D-1 demodulator is the last block in a TVRO system, it is where the 70 MHz IF signal is converted to video and audio. The D-1 contains a PLL demodulator, video processor (CCIR de-emphasis, 4 MHz low pass filtering and 30 Hz clamp), dual sound sub-carrier demod and AFC circuitry. The power requirement is small, 15 VDC @ 200ma., signal input is -20dbm @ 70 MHz. AFC will enable the user to lock most any VTO L.O. with no problem whatsoever. Video and audio outputs are a standard 1 volt p-p suitable for driving any monitor, VTR, or modulator.

SPECIFICATIONS:
Signal input: 70 MHz at -20dbm (22mv)
AFC lock range: greater than 5 MHz
Sound subcarriers: 6.2 MHz and 6.8 MHz fully independent
Video level out: std. 1 volt p-p
Audio level out: 1 volt p-p
Power requirements: 15 VDC @ 200 ma
Demodulator: NE564 PLL IC
Tuning voltage out: 2 to 13.5 volts
Tuning voltage in: 0 to 15 volts max

D-1 Demodulator Kit $99.95
D-1 Demodulator PC board only $49.95

Part Number	Description	Price Each
Avantek GPD-1002	1 GHz, 12 db gain TO-8 can amplifier, 15 VDC	$45.00
Watkins-Johnson V802	2.5-3.7 GHz VTO, lower noise than Avantek types	120.00
Watkins-Johnson V705	600-1000 MHz VTO, lower noise than Avantek	120.00
Signetics NE564	PLL selected to operate at 70 MHz	7.50
Van-L DBM-500	4 GHz mixer, SMA connectors	85.00
Amperex ATF-417	1 GHz, 25 db gain hybrid amplifier, 20-24 VDC	19.00
Motorola MWA-110	400 MHz, 14 db gain, -2.5 dbm	9.00
Motorola MWA-120	400 MHz, 14 db gain, +8 dbm	9.75
Motorola MWA-220	600 MHz, 10 db gain, +10.5 dbm	12.40
Motorola MWA-230	600 MHz, 10 db gain, +18.5 dbm	13.50
Motorola MWA-310	1 GHz, 8 db gain, +3.5 dbm	12.40
Motorola MWA-320	1 GHz, 8 db gain, +11.5 dbm	13.50
Motorola BFR-90	3 GHz F_t NPN transistor, 15 db gain @ 1.2 GHz	2.50
Motorola MRF-901	3 GHz F_t NPN like BFR-90 but 2 emiter leads	2.75
Regulators. 7800 Series	5V, 8V, 12V, 15V, 1A TO-220	1.50
Regulators: 7900 Series	-5V, -8V, -12V, -15V, 1A TO-220	1.75
IF Transformer	10.7 MHz IF can be padded to 6.2 or 6.8 MHz	1.25
Tuning capacitor	10pf multi-turn for filters, PLL, etc.	.95
Coil form + can set	Nice coil form set for filters, good to 120 MHz	2.00

Sat-tec Systems; Box 10101
Rochester, NY 14610; (716)381-7265

TVRO CABLE PACKAGES!

Now available - special RG-217 low-loss cable assemblies with fittings and rotator system pigtail to get you from LNA to receiver efficiently!

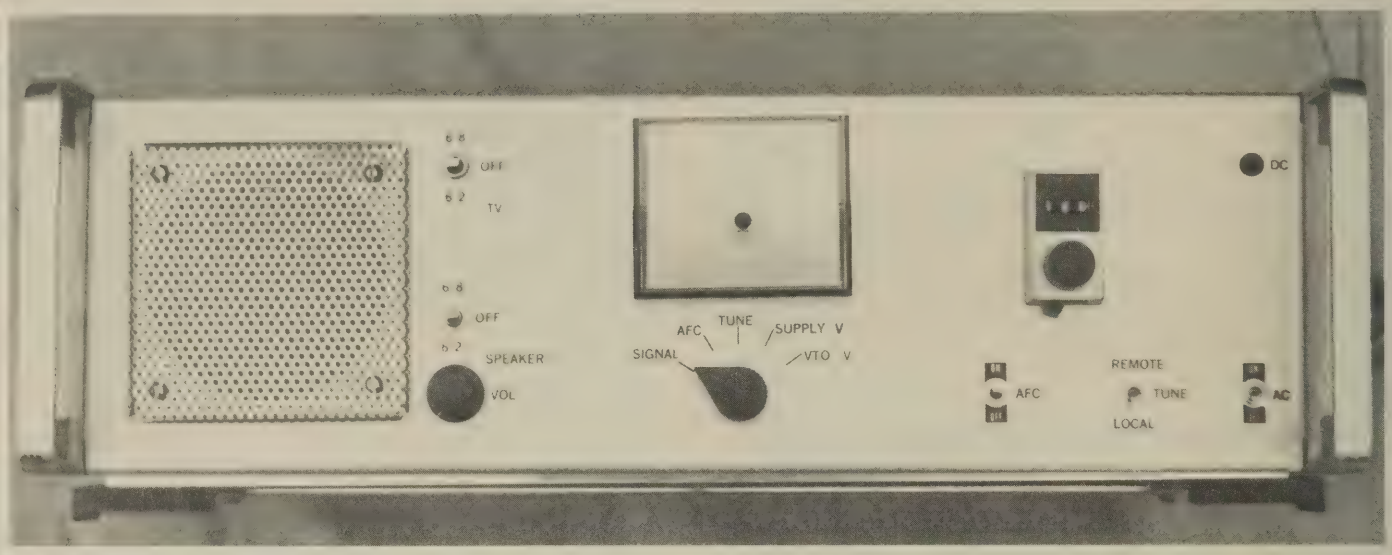
#1]80 feet RG-217 plus 3 foot flexible pigtail to connect to your LNA (allowing full LNA rotation for polarization switching); all connectors installed, ready to hook-up! **$96.50** (plus UPS charges).

#2]40 foot extender assembly plus coaxial barrel connector to allow you to extend the above basic 80 foot package an additional 40 feet (120 foot run total). **$47.00** (plus UPS charges).

PLUS - We have the **lowest** prices on super-top-of-the-line Amplica 120°K (50 dB gain) LNAs today. To make our LNA deal even better, you can buy any of our cable assemblies at 50% off this month with an Amplica LNA purchase!

SEE US AT SPTS '80 SAN JOSE!

AVCOM of Virginia, Inc.
10139 Apache Rd., Richmond, VA 23235



NORTH AMERICAN HOME VERSION - of the new Taylor Howard designed receiver as will be manufactured by Vancouver's Satellite Supplies. This unit, one of 5 assembled by Howard for the Canadian firm, could be considered a pre-production-run proto-type.

LNA**plus** receiver package). The Rohner 'Combo' package by the way could be separated (as a separate LNA) although they haven't any plans to do this right away. **We have concentrated** on getting more people who have LNA building experience on the program however as we'll visit shortly. If there is any really big LNA news at SPTS San Jose, it may be some slight price reductions in the existing commercial products.

(3)**Antennas** - The 'spherical' design and many new metal and fiberglass and foam antennas will be on hand. As reported in both April and May, Hayden McCullough's 8-Ball spherical will be on display and available for delivery. We wouldn't be too shocked to see an operating 8 foot 8-Ball and **perhaps** even an operating 6 foot 8-Ball antenna in San Jose. Also new there will be 10, 12 and 16 foot 'Eagle' Spherical section antennas from Wagner Industries (Box 559, Alva, OK 73717). Chaparral Communications now has a basic 10 and a basic 14 footer with extension panels to make them 12 and 16 feet respectively. They have a new Tay Howard designed feed similar in concept to the Birkill Hybrid Mode feed which looks like a winner; the day of the standard feed horn may be over! Satellite Television Systems of Poplar Bluff, Missouri (R #1, Box 132B, 63901) plans a newly designed fiber-foam panelized antenna, plus whole packages (including LNA and receivers) for dealers and distributors.

Through all of this is the word 'innovation'; virtually all of the new firms now entering the field are expanding upon the basic technology, not content to merely 'copy' and cheapen. That's a good, healthy sign that ingenuity is not dead in this field (we never thought it was!).

This barely touches the surface of the more than 30 exhibits already taken (we'll have at least twice as many in San Jose as Miami!); to those who didn't get their products mentioned, stick around; we'll see that everyone exhibiting gets a review in the August issue after SPTS!

AND THE PROGRAM...

The San Jose program is very innovative; which simply says that we don't feel locked into any past formats. Here are some of the highlights:

1)**Technical** - Sessions will run from 10 AM on the 4th through 9 PM with appropriate breaks for lunch and dinner. They will run on the 6th from 10 AM to 3 PM with a break for lunch. Saturday the 5th will be a really neat day; we have set aside an area and created a schedule whereby experts on LNA design, antenna design, receiver design and system's design will hold informal group sessions. You can wander in when these mini-sessions are going on, sit down close to the guy who is the expert, handle his equipment and talk with him about what it is he has done to make it work. We plan to videotape these informal sessions and then run the tapes back on the MATV system later on the 5th and early on the 6th. For all who didn't get the opportunity to fondle equipment and talk shop in Miami, this will more than even the score.

The full sessions will include (this touches but the tip of the iceberg) the following: (a)**Single Conversion Systems** - Norman Gillaspie and David Barker (see twin articles this issue of **CSD**); (b)**Antennas** - Nelson Ethier from Montreal who will discuss and explore building your own lower-cost parabolic antenna; Hayden McCullough will disucss Spherical antenna design and the feed system; (c)**Microwave Technology** - Steve Chambers of Rohner will describe stripline design techniques while H. Paul Shuch will outline the problems and pitfalls of active mixer design at 4 GHz; (d)**Receivers** - John Ramsey will describe how you build a commercial TVRO receiver for less than $1,000. Taylor Howard will counter with his own thoughts on lower cost receivers. (e)**LNAs** plus front end design - John Rohner will describe the 1984 Receiver while Bob Luly will tell you how to build 4 GHz GaAs-FET amplifiers.

There will of course be much more. Steve Gibson will tell you all you ever wanted to know about 'satellite navigation'; how to design a series of antenna mounts that can even be motor driven and controlled precisely by a TRS-80 computer program. Coop will conduct a session on audio and data reception services on the birds including a look at lower-than-TVRO system packages for ARO (audio recieve only) purposes. We'll have displays of direct satellie reception of audio, RTTY and other narrow band services.

The Hyatt in-house MATV system will 'transmit' on a pair of channels no less than 40 hours of all-about-satellitess programming information including both special videotapes prepared in the field as well as videptape coverage of the seminar sessions themselves. As we have previously announced, if you register early enough to get into the Hyatt, you can bring along one or more VCR units and tape away to your heart's content. (We suggested last month that you had better bring around 50 'blank hours' of video tape with you!). Each morning (4th, 5th and 6th) you will awaken to a special on-MATV-system "**SPTS '80 Good Morning Show**"; a look at the technology to be described in sessions that day on the SPTS '80 program as well as some highlights of the previous day. This will be quite a video event!

STATUS REPORT - ROOMS

As of mid-May (our deadline for this issue of **CSD**) around 50% of the Hyatt rooms have been taken. The Hyatt has agreed to hold **without deposit** any rooms requested **prior to** June 13th;

after that date, if they have any rooms left, to be guaranteed a room you'll have to submit a deposit with your room request.

When you pre-register with us for SPTS '80 you receive back by return mail a four page detailed-instructions confirmation letter. Also included will be a Hyatt Hotel registration card. You will fill in that card and **promptly** return it to the Hyatt where your room assignment will be made.

NEW MANUALS

A **minimum** of three new manuals from STT will be available for the first time at SPTS. Included will be:

1) **NELSON TVRO PARABOLIC ANTENNA MANUAL** - all you ever wanted to know about designing and building your own lower-cost TVRO antenna, mount and feed system. PLUS - a unique concept in 'sharing of the mold-form' for this antenna so that many people can build off of a single sub-structure.

2) **GIBSON TVRO NAVIGATION MANUAL** - The complete world of mounts from super-simple (using a child's play swing structure or borrowing the backyard clothesline support!) to the super sophisticated (a computer driven fully automatic terminal that will switch birds for you on command!). PLUS - an easy to understand set of complete instructions on aligning your dish to the satellites using the sun (a Sun Compass is included) and an inclinometer (also included in the manual!).

3) **Coop's SATELLITE USER'S MANUAL** - How to find, demodulate, de-cipher and enjoy all of the various wideband and narrowband (SCPC, data, RTTY, network radio links, etc.) transmissions on satellite. Virtually every radio network in America and Canada is now on a bird; you can tune-in the latest Anchorage Flight weather or NPR or even a set of Anchorage AM radio stations if you know where and how to look. Tune-in TV network ''Producer's Circuits'' where network instructions are being sent to remote crews; the latest AP or UPI news wire services and much more!

Each registrant at SPTS will have a choice of selecting **any two** of the then-current STT manuals as part of his SPTS '80 San Jose registration fee; that's part of the package you receive!

NOTE: The July **CSD** will go into the mails so that most people will be able to receive their first-class mail copy **just before leaving** for San Jose. Because of the size of the group sample copies of **CSD** will **not** be given out in San Jose although a limited number of July editions will be on hand.

See you and your friends in San Jose!

STEVE GIBSON, the clever 'Satellite Navigator', will explain how you construct your antenna system so you can change birds with the greatest ease and accuracy.

TECHNICAL NEWS NOTES

FCC PERPLEXED over how to handle sudden influx of requests for Clarke orbit spots. Presently there are 14 3.7-4.2 GHz satellites requesting spots, a total of six requesting spots for both 3.7-4.2 **and** 11.7-12.2 GHz (dual band) birds, and, six more requesting 11.7-12.2 GHz only downlink spots. First argument is how many spots there are; some believe 13, others 17. Those who feel 17 may be available suggest expanding orbit belt on east (such locations would not cover Alaska or Hawaii) and squeezing exiting locations down to 3.5 or even 3 degree spacing. Obviously FCC will have to select those who will get spots; process will start this fall.

WESTAR wants to offer a higher power SCPC service (22 dBw which for relatively narrow bandwidths is equivalent to +48 to +52 dBw video EIRPs) for Muzak and others who wish to directly feed small (4-10 foot) dishes. RCA has complained, says these high power levels may degrade 'delicate' lower power SCPC channels on adjacent satellites.

ATT asking FCC to allow it to launch three new satellites to replace existing three; at cost of $230 million. Firm wants to retain orbit spots at 87, 95 and 128 west.

CONFEREES at 8th annual Communications Satellite Conference in Orlando came to 'conclusion' direct-satellite TV

PASS FCC EXAMS

TESTS-ANSWERS FOR FCC FIRST AND SECOND CLASS COMMERCIAL LICENSE

The Original FCC Tests-Answers exam manual that prepares you at home for FCC First and Second class Radiotelephone licenses. Newly revised multiple-choice exams cover all areas tested on the actual FCC exam. Plus "Self-Study Ability Test" Proven! $9.95 Moneyback Guarantee.

COMMAND PRODUCTIONS
RADIO ENGINEERING DIVISION
P.O. BOX 26348-A SAN FRANCISCO, CA 94126

Please rush me Tests-Answers for FCC First and Second Class Commercial License. My $9.95 is enclosed.

Name _____
Address _____
City _____ State ___ Zip ___

NEW UPDATED EDITION

is 'already here' in North America. Group had misconception such terminals were only practical utilizing 'relatively expensive CATV hardware' and suggested that **if** future satellites will have ANIK-B power (10 watts) in C band (3.7-4.2 GHz) whole terminals for $1,000 may become practical. New SATCOM FIII bird in fall of 1981 **will have** 8.5 watts on at least six transponders so even in opinion of this august group, we are getting close!

DETAILS on WESTAR (FCC) approved high power SCPC service; service will probably be on WESTAR III, transponder 1. Will allow up to 20 SCPC signals into transponder (maximum loading) at 22 dBw EIRP each. Signals will be SCPC 15 kHz wide and main application will be UPI and AP newswire services, radio network feeds designed to be received with dishes in 4 to 6 foot class. Basis for system is that you are trading power for bandwidth; single transponder can normally handle up to 1,200 SCPC channels, with available EIRP split amongst all of them (see special report this issue).

NATIONAL Academy of Sciences sponsored symposium on direct broadcast satellite TV saw speculation that first US generation of 11.7-12.2 GHz DBS birds will offer between 5 and 10 channel (transponder) capability at 20 to 60 watts per channel (present ANIK-B is 20 watts); next generation would have 3-13 channels with powers as high as 500 watts per channel. At 500 watts per channel dish size at 12 GHz would be around 12 inches (!). The time frame on all of this would be 1990'ish.

ANNUAL broadcaster show had smattering of satellite announcements; plenty of high price tag hardware for broadcasters getting their own receive terminals. Most significant announcement was RCA plan to provide 'digital audio' service wherein users could select between two or more simultaneous audio channels fed to stations.

IN THE JULY CSD...

A number of exciting events were taking place as this issue went to press. On May 11th Coop and local enthusiast Tom Gardiner began assembly of an ADM 11 foot antenna to be used for an attempt at bringing in the 'over-the-north-pole' MOLNIYA (Russian) inclined orbit bird. On May 18th the antenna was completed, a 180 K LNA and .4 f/D feed installed and tests were run on the domestic satellite belt. Also on the 18th a pre-production SAT-TEC 24 channel tuneable receiver arrived (this is the $995 wired and tested receiver detailed in the May **CSD**).

At 3:25 PM local time on May 18th after five hours of careful sky searching **MOLNIYA was found on 3875 MHz.** The bird first seen was in a descending node (i.e. leaving apogee) at an elevation of 65 degrees and an azimuth of 22 degrees. The bird was tracked for 65 minutes before the Russians turned it off (switching TV transmissions to the next bird in the chain).

Success from the Russian inclined-orbit bird(s) with a linear feed and a 11 foot antenna plus the new SAT-TEC $995 receiver and a (purposeful) 180 degree K LNA convinces us that reasonably good quality 'Moscow Olympics' reception via MOLNIYA will be possible this summer. A full report in July.

STT TVRO DEALER PACKAGES

SPECIAL EDUCATIONAL PACKAGE - The 'Home Satellite TV Reception Handbook' (now in its fifth printing) has introduced more than 10,000 people to the nitty-gritty world of low-cost (private) satellite TV reception. This $7.50 Handbook is now available to TVRO dealers and educational groups for the unbelievable low price of $2.50 each (shipping paid with US and Canada) **in lots of 50 or more**. Contains 72 pages of data designed to educate a reader on what is involved in having a low-cost TVRO terminal. **Order SEP-1 at $125 per 50 copy bundle.**

SPECIAL TRAINING PACKAGE - A brand new Coop prepared 1 hour 1/2 inch videotape designed to accomplish two things: [1]Provide approximately 10 minutes of high quality video as a **sales piece** that you can show prospective customers; Coop shows what a TVRO terminal is, what it can do. Perfect for one-on-one selling or for public display at meetings, gatherings. A custom 'tag' is also available listing your company as the source for TVRO terminals. [2]ALSO included after the sales piece is approximately 50 minutes by Coop detailing the common pitfalls of TVRO installation; what goes wrong, and why. An excellent personnel training piece. Available BETA or VHS. **Order STP-1 at $60 per tape** specifying VHS or BETA, ($70 if you wish a custom tag with your company name, address and telephone number).

COMBO PACKAGE - Order both the 50 bundle set of 'Handbooks' **plus** the sales and training videotape for a special package price of $175 ($185 with custom tag; US, Canada only). **Order CP-1.**

Ordering Instructions: Enclose payment with order (US funds **only**) to Satellite Television Technology. Delivery 7 to 10 days from receipt of order. Handbooks and tapes shipped via parcel post.

STT
Satellite Television Technology
P. O. Box G
Arcadia, OK 73007
[405/396-2574]

COOP'S COMMENT ON PROGRAMMING

BEING OUR NEIGHBOR - PART TWO

In our Technology Section leadoff this month we discuss the plight of the Canadian private terminal operator who has purchased a US built LNA and then has the unfortunate problem of attempting to get it repaired. The bottom line was simply that being our (US) neighbor can be very perplexing at times.

In the opposite geographic direction from Canada our more southern neighbors are having their problems with our technology as well. Many countries such as Mexico, the Bahamas, the Dominican Republic et al simply don't get all hot and bothered because **a few** residents of their country are 'foolish' enough to want to invest up to 20,000 US dollars to create American TV in their haciendas. The few who can afford such a luxury are not causing anyone else around them any problems with their American TV and since those who can afford are often those with political power or politically powerful friends and business associates, the impact of this technology is simply ignored.

Potentially this may change in the coming year or two simply because those who are dabbling in US space technology by having private terminals are beginning to feel the same motivating forces that caused Canadian pioneer Rod Wheeler to share his private terminal back in 1977. And when the service moves out of the private living room into the public section (either via cable or via the airwaves) the impact begins to spread appreciably. Actually, it is already happening.

In San Jose, Costa Rica there is a new UHF television station on the air. It operates on channel 17 and it operates in a scrambled mode. It has a license from the Costa Rican government and it collects $30 (US) per month from any home that wants the unscrambled service. So far this is Costa Rica's business and nobody elses. But alas the programming for San Jose's channel 17 comes from the United States. It gets to Costa Rica on videotape at the moment but that may change soon and of greater interest perhaps is that when it is taped **for** Costa Rican play **here in** the states it is taken from multiple sources **including** satellite feeds. NOW - that suddenly becomes the business of some US interests since in effect the US copyrighted material is being 'pirated' (yes, that is a nasty word!) offshore for someone's profit.

Nor is this an isolated example. Recently the Republic of Panama granted a license to a chap to build a channel 14 UHF station. This station will be operated in a scrambled mode, a fee will be charged for descramblers-subscription and the programming will come from the US. **How** is not clear at the moment, but one must at least suspect that like the San Jose station it will somehow involve satellite transmission. Oh yes, whereas in San Jose the English language programming on channel 17 largely appeals to that small percentage of the 'upper' class that speaks English fluently, the Panama installation is by design intended to cover a **small** portion of Panama but virtually **all** of a major US base there. The subscribers will, of course, be Americans living in Panama.

Then there is the persistent rumor (and we label it as such) about the proposed super-gigantic cable television system being designed to serve a 'small' section of Bogota, Columbia. According to several different reports from enough different parties that we believe there is at least a shred of truth in it all, an 11 meter receive terminal pointed at FI will collect four US programming services, and then funnel them into a modern CATV system that will pass an estimated 600,000 people (!). The literature prepared lists HBO, SHOWTIME, WTBS and SIN as the programming to be available...at (are you ready for this!)...$75 per month. Will this operation (if real) be a 'legal' user of these signals? Since none of the listed services (nor FI) are apparently authorized to accept 'customers' outside fo the United States, it is doubtful. Bogota then could become the largest pirate operation in the world.

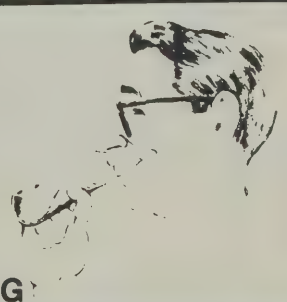
This 'pirate' label is a dangerous one. As the operator of San Jose system found out, after spending months **trying** to negotiate legal rights to the programs, between US laws and private contracts created by programmers there is simply no mechanism available for legal use of US services. Perhaps it made no difference when we were 'isolated' by the limited reach of our terrestrial services. But the satellite service has changed all of that and as a nation dedicated to new technology we should also be just as dedicated to reframing our laws and our regulations **and our contracts** to keep them abreast of the changes in technology.

No, in our humble opinion these operators to our south are **not** 'pirates'. They are frustrated business people, agog at our technology, anxious to share it with their own country, but frustrated by our unwillingness to recognize that they even exist. You cannot set a pushcart in Harlem loaded down with $100 bills and then expect the local residents to ignore its presence.

We are the problem. We send out our boxes and our messages and we overwash all of those within our reach. Our satellites have extended our reach and now that we have an 'electronic media' presence in the neighboring countries, we need to accept the legal responsibility and the moral responsibility that allows these $100 bills to be picked up and used.

Failing to do that, I believe we cannot long maintain that our media cannot be received and re-used as these neighboring countries see fit. Clearly the time has come for our legal framework to catch up with our technology.

CSD



PROGRAMMING

COOP'S SATELLITE DIGEST (Programming Section) is published monthly by Robert B. and Susan T. Cooper doing business as Satellite Television Technology (Ltd.), P.O. Box G, Arcadia, OK 73007 (USA); 405-396-2574. **CSD** is not affiliated with any satellite programming distributor, hardware (equipment) manufacturer or distributor nor satellite systems operator. STT sponsors the Satellite Private Terminal Seminars (SPTS) held three times per year and does produce and distribute 'learning' materials and 'how-to-do-it' manuals relating to the development of the low-cost satellite TV receiving system industry. Subscription fee is $50 (US funds) in advance Canada, US, Mexico; $75 (US funds) elsewhere. Copyright 1980 by Robert B. and Susan T. Cooper.

PRIVATE TERMINAL RECEIVERS A HISTORY

WHEELER IN THE TUNDRA - The first Canadian to have a private terminal, way back in the summer of 1977, Rod Wheeler with his homebrew 15 footer outside his cabin-home in the wilds of the Yukon. He had to 'drag' the dish home more than 15 miles from Whitehorse on a sled over very primitive roads.

NOW TWO YEARS OLD...

It was just two years ago this month that the first designed-for-private terminal receiver was born. Perhaps you never heard about it and you'd like to know where all of this began!

First of all, there was a chap living in the Canadian Yukon by the name of **Rod Wheeler**. Rod was your typical far-northern Canadian with some well voiced disdain for the way those who lived in the far north of Canada had to get along with their remoteness, high prices for everything, and last week's newspaper. Television reception was little better than the tapes flown in from southern Canada and broadcast over a local CBC transmitter. For many of the residents of the Yukon even CBC tapes didn't work simply because no CBC transmitter was available in the area.

So Rod had set out, in the summer of 1977, to do something about it. He and a few cohorts decided that they would install a private satellite terminal. Rod was associated with a cable company bringing in programming via tape to the community of Whitehorse and he decided that if he could round up a TVRO receiver and an LNA he would have a go at building his own 15 foot dish. By the end of June he had it all put together and on a Friday preceding a three day Canadian holiday they turned it on and the residents of Whitehorse were treated to three full days of live television via satellite from such places as Atlanta, Georgia. The reaction of the local population was immediate; **they loved it**. The reaction of the Canadian government authorities was just as immediate. It was illegal.

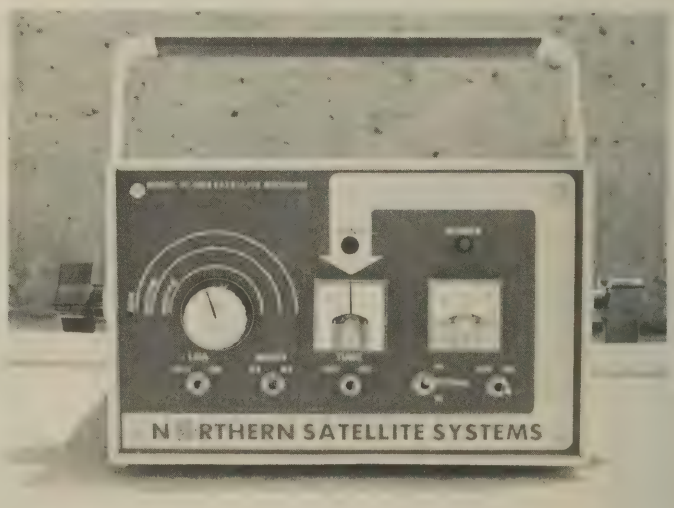
And so early on the first day of regular business following the holiday Wheeler had a visit from a Canadian communications official. **"Turn it off and dismantle it...NOW"** he was told. Wheeler knew going in that there was no precedent for their activity; that at best the Canadian regulations prohibited such funny business. But he had counted on public sentiment, after three days of high quality satellite television, to carry him through the battle with the authorities he fully expected to come.

Public sentiment came alright; thousands of letters, telephone calls and other statements of opinion were dumped upon the authorities; who didn't bend under the weight. And so the terminal was dismantled and the large homebrew antenna was placed on a drag sled and hauled off into the tundra some miles out of town where Wheeler had his cabin-like home. Following a suggestion he applied for an 'experimental license' from the Canadian government and was actually granted one (much to his surprise) with the unlikely 'call letters' of VE9EDX. And so Wheeler had satellie television at his remote cabin while the rest of the Yukon residents returned to re-runs and old taped programs.

Wheeler's fame spread, first by word of mouth, then by newspaper articles, and eventually via the CBC itself. A plan began to evolve in Wheeler's mind. He decided he went wrong by springing satellite television into a community where local CBC service (fed by satellite/ANIK II and tape) already existed and by doing so he was directly challenging the government. His next installation he decided would go into a community where there was no television. Period.

By late in the spring of 1978 Wheeler activities had become so well known that Coop was beginning to hear about Rod. After a few telephone conversations between the two Wheeler agreed to travel to Oklahoma in July of 1978 to take part in a cable television conference being put together by Coop which they hoped to transmit live, via satellite, to hundreds of cable systems nationwide. Wheeler came down to the conference early and met with a talented young hardware designer named Steve Richey. Now Richey was one of those engineers with microwave sensitive fingers. Steve could shove his thumb into a 4 GHz mixer and tell by the way the scope display and picture changed where to cut, where to add and how much to do of both. Between Wheeler and Richey the very first private satellite receiver was born. They called it the PT (for private terminal) 1024 and it carried on the front panel Wheeler's firm's name; **Northern Satellite Systems.**

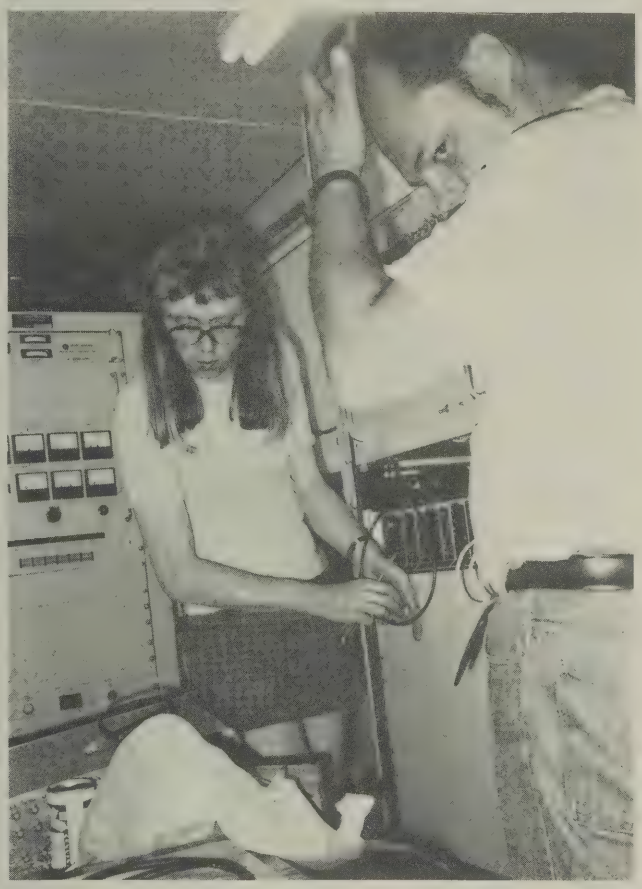
This receiver had lots of eager helpers working on it



WORLD'S FIRST PRIVATE TERMINAL RECEIVER - this PT1024 was conceived by Wheeler and Richey and it started such a furor at a cable TV trade show Richey had to hide it under a table cloth!

although Richey ultimately was responsible for its performance. Now it turned out that in addition in Wheeler, Coop had invited world-known English TVRO experimenter Steve Birkill to Oklahoma for the same conference and Birkill spent a couple of days hanging around Richey's shop trying to decide if Richey was for real or not. There were probably never two more opposite engineers at work. Birkill's fingers are talented but this Steve likes to dope everything out on paper in advance. Richey's mental processes are different; he grabs a handful of parts and a piece of G-10 and starts sticking parts down. Richey seldom commits anything to a written schematic and more often than not no two of his products ever look alike, even if they are supposed to be the same product!

The Northern Satellite Sysems receiver had a bunch of

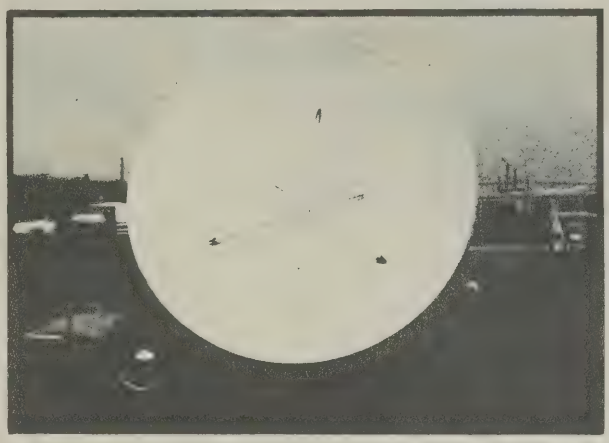


BIRKILL ADJUSTS THE UPLINK - Steve Birkill [left] put his BBC-trained super talented hands to work making a three-year-retired 3 kW 6 GHz uplink transmitter work so that hundreds of cable systems nationwide could 'attend' Coop's CCOS conference in July of 1978.

Richey, a fair amount of Wheeler (who is no slouch as a designer) and just a tad of Birkill in it when it finally le't the Richey shop and headed for the cable TV trade show. Its mere appearance there started a furor.

The whole concept that somebody (anybody!) would actually sit down and design a TVRO receiver for PRIVATE use was more than the cable operators wanted to hear about. Richey finally had to remove it from his display table and stick it under a sheet to keep the angry show goers from popping off about it. The TVRO receiver suppliers with 'traditional' receivers were no more pleased. Here was a receiver priced in the $2500 region that tuned in all 24 transponders, had selectable 6.2 or 6.8 audio sub-carriers, metering of the signal (with AFC on and off), operating voltage metering and a built-in LNA power supply jack. The closest commercial

HIT THE ROAD!



Hit the road with the leader; H & R's STARVIEW System. Nearly 100 systems shipped since Miami's SPTS; our dealers and distributors are on the road TODAY demonstrating and selling private TVRO systems!

STARVIEW DEALER SPECIAL

Complete 10' trailer mounted transportable system with top-quality commercial equipment, including:

- 10 foot STARVIEW parabolic equipped with rotatable feedhorn system
- Avantek 120°K LNA
- Microdyne 24 channel Receiver
- 75' of hookup cable and connectors

With this sytem you can pull up to a demo site and be showing off pictures in 30 minutes time! **The price?** $7200!

STARVIEW BASIC DELIGHT

Nobody can beat this package for high performance and low price! Included for $3995 are the following:

- 10 foot STARVIEW parabolic with feed horn
- Avantek 120°K LNA
- International Crystal 24 channel receiver

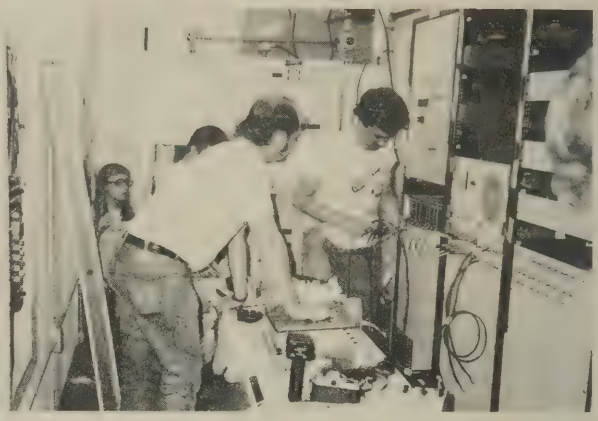
We also have 13', 16' and 20' antennas, and, systems and the experience to design and ship your system 'off-shore' to non-US locations. PLUS - we stock and sell LNAs, receivers, feedhorns and cable/connectors!

HIT the road with the 'Hit-Of-The-Road'; a STARVIEW system from H&R. YES - a limited number of dealerships are still available!

HIT THE ROAD!

H & R Communications
STARVIEW SYSTEMS
Route 3, Box 103G
Pocahontas, Ark. 72455
(501-647-2001)

RICHEY'S 4 GHz FINGERS - tweek away on a demod board while he trains his eyes on a monitor as one of dozens of boards he built and tried gets the real world test before the first PT1024 receiver was built and handed to Wheeler.



WHEELER AT WORK - The Yukon's Rod Wheeler, [right] in front of rack, puts the finishing touches on the uplink transmitter; that's Steve Birkill nurturing a US beer in the back [left] corner, working on the cabling for the uplink power supply. Wheeler's wife sat at home in the Yukon and watched her hubby via satellite!

receiver at that time was priced around $5,500. Clearly $2500 was a stab in the pocketbook.

Worst of all here was a receiver that actually suggested that it would be used in a **private** residence. Why even the front panel was labeled 'WESTAR', 'ANIK' and 'SATCOM'! Richey, who was never well understood in the CATV world anyhow, spent most of the show hiding away behind pillars. Wheeler smiled a lot (he had anticipated the reaction and since he was going to sell them **only in Canada** anyhow didn't care what the US cable operators thought). Birkill pretended he never heard of Richey; but not because he didn't like the concept. He just didn't get along well with the wild-eyed and usually unpredictable 'other Steve'.

Perhaps six receivers like the one shown here were actually built. No two were alike, and any one of the six is a collector's item these days. Richey was under contract to build another 20 or so for Wheeler and then Wheeler was planning to shift the final part of the assembly operation to Canada where more favorable tariffs prevailed. Alas Richey quickly learned what today's neophyte manufacturers are learning all over again. The LO source in the Richey receiver was a Frequency West device; an expensive at the time box that came all sealed up with no user adjustments. The price plus the indefinite (like never!) delivery schedule bothered Richey so he set out to do it his way.

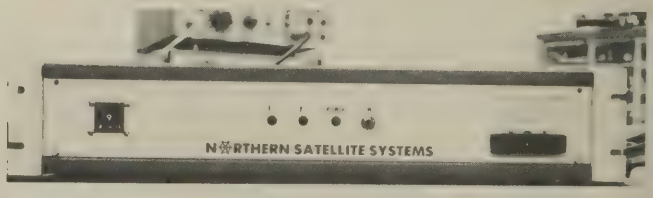
His way was to work around long lead times on parts that never came. At that particular moment VARI-L DBM500 mixers were not that difficult to get (the big interest had not yet begun) but LO sources were totally impossible. So Richey set down to tackle the problem in two ways; first he would design a receiver with a low cost MRF901 type descrete LO source (his discussions with England's Steve had convinced him he didn't need to be using $500 Frequency West boxes). Then he would design a receiver which required only one of the hard to get LO devices but which was capable of providing up to **12 separate channels** of demodulated video and audio **at one time.**

Richey created the concept that if you built one high-quality down converter (taking all signals from 3.7 to 4.2 GHz down to 500-1,000 MHz) you could then build up a chain of separate second conversion down converters to independently select anyone of 12 different signals. Downconvert once from the GHz range; down convert a second time using less hard to find parts as many times as the headend needed it done.

Richey called this concept the 'Master' and 'Slave' system. Wheeler was beginning to call Richey other things since Richey's inability to delivery was causing the Canadian more than a few problems what with winter coming on and all. Wheeler had planned to install no fewer than 15 private terminals before winter set into the Yukon. He had lined up antennas (he would build his own at first) and had ordered a slug of LNAs to back up this plan. Richey however, because of Frequency West and other problems, was up to his eyeballs in redesigning.

At least one of the new packages with 24 tuneable channels (actually 12 on each polarization) **was built**; a slim-line design which Wheeler felt looked more like an expensive piece of electronics than the original handle-carried test-equipment enclosure package. And then winter hit the Yukon and Richey got snapped up (as in swallowed) by a Texas company that wanted him and his small firm to tool up for

THE MONSTER THEY CREATED - believe it or not this 11 meter [nearly 37 foot!] antenna was assembled by hand with no equipment, hoisted into the air and made operational by around two dozen volunteers that included Wheeler and Birkill. Around 15 hours of technical sessions were sent via RCA SATCOM to hundreds of cable systems nationwide.



LAST VERSION - perhaps only-one every completed, this thumb-wheel dialed receiver was Richey's last effort on behalf of Wheeler before Steve R. bailed out of the program.

radios in the high dollar CATV market where radios were commanding big bucks and the delivery lines were long.

What happened to these pioneers? Well, Richey today is tending to a family owned and operated mini-CATV system complex in eastern Oklahoma. His talented microwave thumb is silenced for now, tending to repair of his traditional line amplifiers and other pieces of not so exotic stuff. Birkill was never really a part of the first shot at home terminals although it was while he was in the states that some of us saw our first real-live working PLL demod for video. While spending a day at Richey's shop Steve B. had rounded up the parts to build up his basic bandwidth - limited PLL unit. He, Richey, Wheeler and Coop were present at Coop's when Birkill jumpered out of the 70 MHz IF of a Microdyne commercial receiver and into his PLL board one evening late in June of 1978. "**Look at that...there's a picture**" exclaimed Wheeler. Richey and Birkill were hardly talking by this point so Richey just opened his eyes 6 extra dB in dis-belief. Coop ran around looking for a camera while Birkill played with the adjustments on the PLL chip.

Wheeler. Rod is now a resident of British Columbia and he continues in the TVRO business under the name NORSAT Systems. He's still designing receivers, building antennas, and poking pins into the 'establishment' in Canada. In fact if you are planning to be in San Jose you'll have the opportunity to see Rod Wheeler perhaps twice. A videotape made back in 1978 when Wheeler was in Oklahoma during the fabled period just recounted will run through the SPTS '80 MATV system; and, Wheeler will be on hand himself with his NORSAT Systems firm and products as an exhibitor. If you want to talk with a **real pioneer** who has faced down the mounties as they searched his warehouse looking for a 'hidden' 15 foot satellite antenna (they wanted to confiscate it!), look him up!

CLARK MIHELKO ONE MAN'S VICTORY

WHERE THERE IS A WILL...

Clark Mihelko of Fallbrook, California (754 Rainbow Creat Road; 92028) would possibly be considered by many to be 'dis-abled'. Suffering from Vertigo, officially disabled by the whirling and dizziness associated with the ailment, he has been forced to adapt his life style to his condition.

Mihelko is building a satellite terminal. He's doing it with his own two hands, the occasional physical strength of a few local 'braceros' and the support of his wife. He should serve as an inspiration to everyone who thinks that starting with a zero knowledge base concerning satellite reception, not a surplus of funds, and a physical disability puts you out of the running.

Mihelko, in spite of his ailment and 55 years, perhaps has the kind of background which suits him to the project. First radio and telephone service and a stint with the Ohio Bell folks doing inside and outside repair work. Next to the profession of tool and die making, followed by a period as an audio recording engineer which brought him close to his first love, jazz.

LOW NOISE AMPLIFIERS
MAJOR B NDS-Low Prices-Write!

3.7 — 4 DOWNCONVERTER

70 MHz out
rol tuning
able
95.

Polar M Rotation
SU

THIS PRODUCT NO LONGER AVAILABLE

- Teflon PC Board dielect $14.00
- Chip capacitor kit 12 each, 60 , 39, 220, 470 pf...only $18.00
- SMA and Type N connectors
- .141" Semi-rigid coax $3.45 per foot
- 2"x14" copper tube for Birkill feed. $12.00

SATELLITE INNOVATIONS
P. O. Box 5673, Winston Salem, NC 27103

Add $2.00 shipping and handling.

SATELLITE TV RECEPTION MADE EASIER!

For those who are working with the Coleman or Howard T RO system Manuals, here is a selection of PC board or assembled units which will get you 'up' and air' much sooner!

The fr rds piggy-back to our LNA amplif xer boards to provide you with regul the important low noise amp!

Mo	Board	Kit	Wired/ Tested
MB		$10.00	$20.00
SDAB-F		.00	$30.00

To recover f systems designed to ing for subcarriers. W ecify subcarrier freque sy 'stacking'/switchin

Model	PC Bo
SAA-2	$3.0

If you are fighting the battl .0 MHz IF system **with** a built-in demod us a channel 3 RF remodulator, here's your an ver! To add audio, order one or more SAA boards.

Model	PC Board Only	Kit	Wired/Tested
70HIF	$10.00	$150.00	$300.00

All boards are supplied with complete data for construction. AND - call or write us about our NEW TVRO receiver!

For more information, contact:

ROHNER MACHINE WORKS
John P. Rohner/7th & Elm Streets
W. Liberty, Iowa 52776
(319-627-4212)

THIS PRODUCT NO LONGER AVAILABLE

12 FOOT OF SURFACE - weight under 300 pounds, accuracy to 1/8th inch and total cost of antenna, mount, feed around $350.

HAND OPERATED elevation adjustment being performed by Mihelko's wife.

Last August Mihelko discovered the world of satellites. Starting with the same manual set this whole private industry has grown up on he decided to work out his own design for a 12 foot parabolic antenna, a mounting system and a pair of feeds; the popular Tay Howard horn and the Birkill dual-mode or hybrid feed. Which brought him squarely against the first major hurdle; finding none of the materials he needed in sufficient quantity he located a firm in San Diego that did developmental work in tubing, sheet metal and the like. Additionally, this shop had the only 1 inch roll forming dies in extreme southern California and Mihelko decided this was exactly what he needed to get his struts rolled as he desired.

For $285 he got 1 inch black iron pipe and had it roll formed to a 6 foot radius for the 12 foot dish and an additional 21 pieces of 1 inch black iron pipe roll formed and cut to length for his radius supports. And it all fit together to a tolerance of 1/8th inch.

After hauling the materials home (by allowing the pieces to stick out the rear window and protruding into the car trunk after the back seat was removed) he next scribed upon the garage floor a 'perfect' 12 foot circle with a 6 foot radius. He followed this by scribing a 12 foot radius circle for the parabolic

ELEVATION ANGLE indicator on Mihelko's 12 foot dish.

MIHELKO'S 12 FOOTER here equipped with feed based upon Birkill hybrid mode design [see CSD February 1980].

surface, and to check on the roll formed spokes as the support structure went together

He welded the 12 foot round circle and with a carbide grinding disc attached to a high speed drill he notched 16 spokes at the perimeter to the dish to exactly a 1 inch diameter so that it would be flush to the outer edge of the antenna.

The antenna surfacing selected was 1/8th-inch-opening galvanized screen procured at the local lumber yard. By starting with a 4 foot wide roll, 40 feet long, he cut the screen in wedge shaped pieces to fit the 'spokes' and to minimize the surface discontinuities. The surfacing is secured to the spokes with a 50 cent roll of 18 gauge copper wire; 'tied down' as it were rather than going through the laborious and perhaps counter-productive process of hard-fastening each wedge to the spokes.

Next he designed and built a polar mount which he describes as simple and functional; proudly noting that it is so balanced that his wife is able to move the dish from satellite boresight to satellite boresight with ease. The polar mount **post** consists of three pieces of pipe (1/4 inch thick wall) all fitting inside one-another (1/32nd inch clearance); this makes a total polar mount support pipe that is 4.5 inches 'thick' with a virtual 3/4 inch wall thickness. This is imbedded into a 3 foot deep concrete pier 1 foot in diameter and then the ground area under the antenna is covered with a 6 inch slab. The slab has been painted white and a transit was used to spot the true north heading and then a compass was used to mark off the white-paint-covered slab in compass degrees with the Pole Star as a reference.

The antenna weighs a total of 265 pounds. A special 3 foot ring of 1 inch pipe is welded to the exact center of the antenna. An adapter constructed from 4 inch pipe is welded and then slid in and pinned at the axis. The antenna has a double 5 inch roller bearing and rotating for azimuth is very simple and painless.

Mihelko has done this essentially alone, getting around with a cane 50% or so of the time, taking it a piece at a time and making sure the system is as foolproof and easy to work on as possible. We think he is living proof that you don't have to be an electronics engineer nor have thousands of dollars to invest or even be able to get around fully unencumbered to be a part of this satellite revolution. Mihelko will be in attendance at SPTS '80 in San Jose; look him up there or if you think he can help you out with your own TVRO antenna project, drop him a line in Fallbrook at the address given in the front of this report.

SELECT YOUR CATV SYSTEM
Satellite Programming
INTELLIGENTLY...
...with SAT-Guide

Twenty channels of programming today on FI, soon 35 on FI and D2. Keeping up with what is 'up', when, is almost impossible. Until SAT-Guide.

ALL FI programs on **all** transponders are listed in this unique programming guide to satellites. INCLUDES daily program listings PLUS monthly summaries of movies, sports and specials. Only $28 per year from:

SAT-Guide P. O. Box 1569
Division of Commtek Hailey, ID 83333

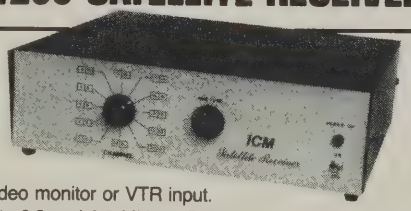
EAGLE

SPHERICAL SECTION ANTENNAS
10, 12, 16 Feet
To be introduced at SPTS '80 Calif.
Moderately Priced

Wagner Industries
Box 559, Alva, Ok. 73717
(405) 327-1877

NEW ICM TV-4200 SATELLITE RECEIVER

Provides You With These Features For $1,995



- Output levels compatible with video monitor or VTR input.
- Dual Audio Outputs 6.2 and 6.8 MHz. • Built in LNA power supply
- Tunable Satellite channels 3.7-4.2 GHz.

International Crystal Mfg. Co., Inc.
10 N. Lee Oklahoma City, Ok. 73102 405/236-3741

ICM

SMALL SYSTEM APPLICATIONS

REPORT FROM COSTA RICA

The Erick Roy installation in San Jose, Costa Rica continues to get a good workout and since Roy is one of the earliest pioneers to 'feed back' data on how well it is working we felt other readers in Central America and northern South America would be interested in his results to date.

Roy is currently utilizing an ICM receiver with a standard (25 MHz) IF and a DEXCEL 120 degree K LNA (33 dB gain). His dish is a homebrew 5 meter (see photo) which can be adjusted in azimuth and elevation to track through the satellite orbit with a prop-pitch motor drive.

Roy has looked closely for signs of WESTAR III, COMSTAR D2 and COMSTAR D3 to date and his best results have been with D3 at 87 degrees west. No concentrated effort has been spent looking for SATCOM I or II or the WESTAR I and II birds to date.

COMSTAR D3 has the best signal into Costa Rica although not all of the 'fat' signals are on that bird's Caribbean beam boresight interestingly enough (the San Juan boresight channels are 4,8,12,16,20 and 24). Most of the video feeds seen to date have been on transponder 4 although video has also been observed on transponder 23. Audio and data channels, apparently going to San Juan, are on fulltime on transponder

COSTA RICA HOMEBREW antenna of pioneer Erick Roy.

20. Video testing has also been observed on transponder 24, again a Caribbean beam transponder. For the Caribbean beam channels Roy should be between 30 and 31 dBw in ground level signal. His pictures to date on the video seen has been 'way above sparklies' on the transponder 4, 23 and 24 signals suggesting that either the footprint is hotter than the EIRP maps would lead you to believe or his system is operating awfully well. Weekend video feeds, in both English and Spanish, apparently headed for Puerto Rico, are commonplace on 4 with Sunday morning a favorite feed-time.

The biggest mystery to date involving COMSTAR D3 has been the appearance of high quality video (a network baseball game feed in English from the scene of the event apparently back to network central) on transponder 23. Now this transponder is supposed to be on the switchable Alaskan/CONUS boresight antenna and since D3 is not capable of seeing Alaska entirely anyhow one has to assume that the beam is operated in a CONUS configuration most if not all of the time. In this event the predicted EIRP in Costa Rica would at best be in the high teens; not the apparent 30+ level Erick has noticed. There is no logical **textbook explanation** for the strong transponder 23 video signal observed and other transponders in that set (3,7,11,15,19) which are known to be carrying data a good portion of the time according to states side observers have not been seen. Roy suggests that because this is a boresight switchable transponder that there may be a hidden 'glitch' or antenna sidelobe in the pattern which was not detected (or was overlooked) when the bird was on the antenna test range on the ground. When a baseball game network feed was logged on this transponder another observer in central Florida was also watching and the signal was many dB hotter in Costa Rica than in Florida; evidence that Roy's 'antenna glitch' theory may indeed be valid.

This of course raises the question of what other high-level sidelobe glitches might be present, on either D3 or other COMSTAR series birds since all employ the boresight switching technique detailed in the April **CSD**.

A very low level signal (perhaps 1 dB C to N) from WESTAR III at 91 degrees has also been noted but Roy adds "**while peaking the antenna on it one day the signal suddenly jumped up in level so that a color set of video could be seen just for a few seconds, and then it went back down again just as abruptly as it appeared**". This was probably due to Roy's observing while the bird was being re-positioned by thruster rockets within its 'space box' and the bird momentarily 'rocked' bringing the boresight enough further south that his signal level was enhanced.

Roy's present project is to build a larger (21 foot) parabolic, to reduce the IF bandwidth on the ICM receiver to the 15 MHz region and to cool his LNA hoping to get it down far enough it will function like an 80 degree K unit. We all wish him luck!

MORE ON ANIK-B 12 GHz SERVICE

Recent reports from Canada suggest that TeleSat (operator of the ANIK-B service) is seriously considering cutting off the present 12 GHz 'experimental video service' as early as this coming September. The 12 Ghz program has been funded primarily to test the usefulness of the service in **direct-to-home satellite operation** and TeleSat has procured from Canadian suppliers approximately 100 terminals in the 4 to 6 foot size range and scattered them throughout portions of Canada. As reported in **CSD** in recent months, the present service is Vancouver stations CBUT (CBC affiliate) and CHAN (CTV affiliate) which share a 72 MHz transponder in a 36 MHz-each split transponder format.

TWIN 12 FOOTERS uplinking CBUT and CHAN to ANIK-B at Burnaby, B.C.

Just to put everything associated with 12 GHz into size perspective appearing here is a photo of a pair of 12 foot (!) uplink terminals located aside a pair of twin TeleSat trailer vans in Burnaby, B.C. These terminals uplink the two signals independent of one another to ANIK-B; the CBUT feed is fed via terrestrial microwave from downtown Vancouver. One Canadian observer reports that while TeleSat may indeed decide to terminate the CBUT/CHAN 'experimental' feeds this coming September or soon thereafter, a new 12 foot uplink antenna is being assembled and installed in downtown Vancouver at the CBC/CBUT site. The **rumor** is that this terminal will at least continue to feed CBUT via ANIK-B's 12 GHz circuit even if TeleSat does close down the present uplink site in Burnaby.

Satellite Supplies, the Canadian firm that is in the process of putting a domestic version of the Taylor Howard 24 channel tuneable receiver into production (see CSD for May 1980, page T5) would like overly anxious dealers and distributors to 'cool it' until the firm is ready to show the

product at San Jose SPTS '80. The announcement in the May Digest created a considerable influx of inquiries and the most unfortunate part was a mix-up of the telephone number which was listed in the report. Seems the number given was incorrect and the poor people who have that number in Vancouver had to ask the telephone company to change it because they had received nearly 100 calls! If you feel you **must** have early information, contact Russell Walsh at Satellite Supplies, P. O. Box 278, Aldergrove, B.C. VOX 1A0. Don't attempt to call at this stage; just wait until San Jose to talk with them personally!

SATELCO- High Quality Private Terminals

SPECIALISTS IN OVERSEAS systems for domestic and Intelsat television reception, fast processing of export orders and design and sytems for 'difficult' reception areas. Antennas from 10 to 20 feet available.

PLUS - currently closing out inventory on a popular brand 10 foot TVRO parabolic (and some associated electronics); **we can save you real money** whether foreign or domestic buyer!

SATELCO- 5540 West Pico Blvd. Los Angeles, CA 90019 [213] 931-6274

THE PROGRAM WINDOW RELEASE GAME

HOW MUCH A HEAD?

The latest announcement of a would-be satellite television pay-movie programmer has stirred up a hornet's nest. The (J. Paul) Getty Oil (Company) and four of the major Hollywood movie producers/distributors will form a new 'pay television network'. The movie producers involved are 20th Century-Fox, Paramount, Columbia and the giant of them all, MCA. According to preliminary reports Getty Oil is willing to bank roll the new venture to the tune of $30,000,000 and those are a lot of zeros.

On the surface, an announcement that HBO/SHOW-TIME/The Movie Channel/HTN may have some competition on the bird should evoke only mild dis-interest. Below the surface the existing pay movie oriented programming firms are raging mad, threatening lawsuits and generally letting anyone and everyone know they are mad and won't stand for this. Why should there be this violent reaction to competition?

Let's go back to the movie biz just a minute. When a movie is released to theaters, the investors in the flick attempt to re-coup their bucks by charging whatever the tariff will bear. Let's assume just for discussion a low number like $4 a head for each participant that passes through the turnstyles and into the theater.

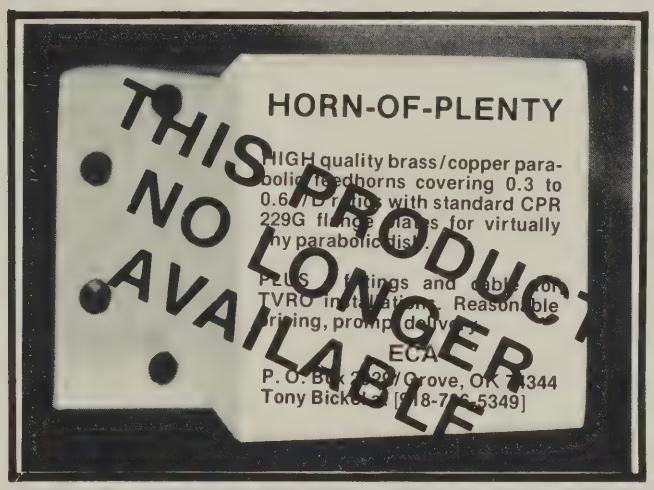
The movie folks are paranoid about gate security. They **know** people are dis-honest because they make movies about dis-honest people. They **know** people will attempt to steal their product because in Hollywood stealing is a way of life. They are also dis-trustful of their own close associates, the theater owners and operators, and routinely the movie distributors send out 'ringers' to inspect the methods in use by the theaters to sell tickets and collect fees for the showing of their product. In the past few years they have waged an on-going battle against pirating of their product and with the advent of videotape they have become extra sensitive about pirated dubs of their product and the worldwide distrubition of same; often concurrent with or even ahead of the time that they release the product initially to their captive theater chains.

One way they attempt to control security, which is another way of saying protect their gate, is to break up the theater release schedule in such a way that the movie initially only goes to those theaters where security is rated as high and where their recent-past experience tells them that the theater operator rates high in his own honesty of turning in the proper share of the gate proceeds to the distributors. These proceeds are themselves often a heavy portion of the total gate take; a $4 ticket may put as much as $3 into the pocket of the distributor/producer/releasing agent with but a buck staying at home for the theater owner/operator who provides the hall, does the advertising, and cleans up the mess in the balcony afterwards. Not all flicks demand 75% of the gate of course but a surprising number of them demand and get it. The theater operator is not in much of a position to haggle; he must have big name stars and highly publicized pictures to attract and crowd and pay his rent and the distributors know who is vulnerable and who is not. For the most part each film released carries its own bargaining schedule and the distributor/producer's agent is on the road with a 'window' in which he is authorized to make each deal. The higher he gets the theater operator in the 'window' the more his commission so there is ample incentive all the way around.

The good old days of renting a quality film for an indefinite run for a flat fee are gone and forgotten. Movie distributing, like movie making, is not your wholesome, All-American sport.

If the $4 ticket is the street price, the producers feel they have a period of time (a 'viewing window') during which they can command **that** price. This particular window may last 90 days for a flash in the pan film that never gets off the ground to 6 or even nine months for some biggie like Smokey. This window is the big ticket window...the period when the original movie investors get their highest return.

For the most part nobody has dared to tamper with this window or to broaden it. Everyone simply assumes that the first 3 to 9 months after a film is released, it is going to stay in the theater circuit and nobody else in the movie distributing business is going to get a crack at that film until **this** 'window closes'. In the real world, even if a film bombs after 90 days it stays in the theater circuit window for a full nine months as a minimum just because that is the policy.



Well, it has been the policy until recently. Then along came direct distribution of the movie on such new innovations as videotape and video disc. The success (however limited in truth) of Fotomat in distributing movies for either a rental fee (typically $8 to $15) or for sale (typically $60 up for a feature) has opened some Hollywood eyes. On the surface an $8 rental seems like a reasonable return for one person viewing except of course virtually every movie so distributed gets seen by many people and perhaps many times. That doesn't bother the Hollywood types too much as long as this occurs either at the close of the first nine month window or close enough to it so that on the bottom line people aren't paying $8.00 to take a family to the show when the same family going to the theater would have to pay $16.

The value of any movie, for reasons best understood by the Hollywood hype people who create the demand for the flicks, is a direct function of the age of the film. Like a new car, value is highest the day the picture first hits the street and from that point onward the value decreases almost daily. The exception of course is the big film that starts off as a sleeper, builds an attraction simply because of its sheer excellence (as opposed to the hype that preceded its release) and like Smokey ends up being a big box office attraction.

In the Hollywood mentality each film has a half-life of perhaps 90 days and after that they begin to squirm, weighing the receipts to date against the initial costs of the feature and projecting when or even if they are going to come out.

Subscription (over the air) pay television and cable premium/pay television are new enough that nobody exactly knows how they fit into the initial theater release window yet. Let's see how the dollars work.

1) The theater goer puts down $4 and walks in and gets **one** seat. He might manage to sit through the same feature several times but that is uncommon. Usually he's had all he wants after one showing. The half-life of this ticket price is going to average 90 days but for 'window' purposes it extends to 270 days (nine months). After that period of time we enter the next distribution phase for a picture.
2) Let's say HBO decides it wants our typical picture. They sit down with the producer/distributor and talk money. **HBO** offers them 20 cents per cable home connected to the network for unlimited showings. The distributor laughs and counters with 50 cents a home and 3 showings. Then HBO laughs and counters with 30 cents and 10 showings. They eventually settle on 40 cents per home and five showings in the initial release month and three more showings over the following 12 months.
3) Later, much later, the television **networks** come along and they sit down to dicker. $1,000,000 and three showings they start off. $2,000,000 and one showing is the counter. They settle on $1,500,000 and three showings. And a release window is established.
4) Finally there is the syndication of the film; putting it into some package with perhaps twenty other films and selling the whole package as a package to **individual** TV stations. The rates are sensitive to the size of the TV station's market, when it will show the films (the 'window' again) and how often the station wants to show the films.

This is not the end of the line but is is getting close. Ted Turner bought more than 3,000 film titles for unlimited showing several years ago, before he got onto the satellite with his WTCG/WTBS, and Turner keeps cranking those oldie but goodie films over and over for rental rates established back when he was a poor struggling UHF TV station serving Atlanta, Georgia and not much else; perhaps 50,000 homes.

With each step downward in the release window the security problem gets tougher. For all practical purposes once the feature is outside of the theater release window the security problem is too massive to even attempt to cover. It's one thing to worry about how many people are sneaking into a theater and 'costing' the movie distributors their $3 portion of the entry fee; it is something else to worry about how many people are videotaping the feature from their local cable service and then passing the tape around amongst friends.

Enter now the Getty Oil package once again. Getty and their four producer/distributor friends apparently want to play with the window. They are proposing to establish their own 'nine month window' during which the movie products from 20th Century-Fox, Paramount, MCA and Columbia will e available **only to their own** satellite delivered pay service. In other words, HBO and SHOWTIME and The Movie Channel can go suck eggs for nine months and wait until this new Getty funded pay / subscription service has shown and reshown the product as many times as they wish. Then HBO et al can have it.

HBO immediately cried foul ball. They don't know where that nine month window starts or ends. Does it begin after the theater window, or part way through it? In any event, it certainly would delay when features become available to HBO et al and to them that seems like a 'horizontal conspiracy' put together by a rich oil company and four large movie producers/distributors. Which of course is exactly what it is.

But is it illegal? Perhaps. Perhaps not.

HBO has had things its way for quite some time, gobbling up the vast majority of the cable firms who were potential affiliates. SHOWTIME has come on strong lately primarily after a Texas CATV system discovered that the gullible American public would in surprising numbers pay extra money to subscribe to **both** HBO **and** SHOWTIME if they were offered both at the same time. In fact something like 50-60% of the people who will subscribe to one $9.00 a month service have been signing up for **two $9.00 a month services** since this neat little discovery last fall. So now we have the latest generation of cable systems offering two different movie/premium service channels per month and half or more of the public offered the combo service plunking down more than $20 a month for 'basic cable' (the non-movie channels) **plus two** movie services.

This revelation has not fallen on deaf ears. Getty and the four Hollywood partners apparently got the message early. NOW - one way for them to edge their way into a marketplace is to (1) somehow withhold big name features for a while (which would make their service where the features **would be appearing** early stand out!), and then (2) see to it that the largest cable firms in the country were given every opportunity to carry the new Getty funded service.

Which brings us to the fine tuning. Naturally 'the cable TV bird' is full; SATCOM FI can't handle anymore programmers and FIII is not due up (again) until late in the fall of 1981. So Getty went to SPN's Ed Taylor and offered a deal Taylor could not refuse. It looks like this (subject to the inevitable fine tuning):

1) Taylor's Satellite Program Network on FI transonder 21 will cut back to 50% of the day starting next January 1st. Taylor will shift some undetermined amount of SPN over to the new COMSTAR D2 bird (transponder 13V).
2) In that 50% of the day pre-empted, or from approximately 7 PM eastern to 4 AM eastern Monday through Thursday, longer on weekends, the new Getty funded pay TV service will take over transponder 21 on SAT¶ COM FI.
3) Taylor, mindful of his investment in SPN will meanwhile

GENUINE HOWARD TERMINAL PC CARDS

Bob Coleman and Tay Howard are now producing six PC cards which make duplication of the Howard Terminal (latest version) a snap!

(A) Dual Conversion (4 GHz to 70 MHz) - $25.00
(B) 70 MHz IF and Filter - $25.00
(C) Howard Demodulator - $40.00
(D) Dual (2 channel) Audio - $25.00
(E) Single Channel Audio - $15.00
(F) AFC and Metering - $15.00

These field proven and tested high quality boards are available as a five-board-package for $99 package price (you receive A, B, C, E and F above). Included is complete documentation for construction and a list of parts stocking distributors.

Order from: Robert M. Coleman, Rte. 3, Box 58-A Travelers Rest, S.C. 29690

be looking for ways to make COMSTAR D2 fly. At the moment there continues to be considerable reluctance in the cable industry to make the investment in a second antenna/terminal for the new bird.

Alas, all of this energy is in reality the latest in a long series of cable industry Chess moves. The players keep changing, their moves keep getting more and more elaborate and because they are the primary programmers on the satellite these days all who have an interest in the satellites are forced to keep at least a talking knowledge of their activities. We'll keep you informed.

ADDITIONAL UPDATE ON INTELSAT OPERATIONS

Since SPTS-80 Miami, many enthusiasts are attempting their own reception from the international series communications satellites. Operated by the 100-plus member Intelsat (International Telecommunications Satellite Consortium), the global system carries the majority of international telephone, telegraph, data and television traffic across the world's three major ocean regions. The system was designed for **this** purpose, down to the parameters of the satellite transponders and the geostationary locations allocated. In recent years a new use has come along: many nations of the world have realised the value of leasing capacity from Intelsat for their own domestic needs, in preference to buying outright a space segment of their own. Were it not for this 'new' use of the Intelsat spacecraft, there would be little carried by them of interest to the experimenter.

So what satellites should we take an interest in? Since Early Bird (Intelsat I) in 1965, there have been several generations of Intelsats. At present, two types are in use, the 12-transponder Intelsat IV series and the expanded capacity, 20 transponder Intelsat IV**A**. There are, at various locations around the orbit, 12 serviceable birds, 7 of type IV and 5 of type IV**A**. The main routes are generally served by one or more IVA's, while the IVs act as reserves **or** are designated for **domestic lease service only.**

In the Atlantic region, the following orbital slots and designations apply:

1°W	Intelsat IV F7	domestic lease service only
2.6°W	Intelsat IV F2	reserve
18.5°W	Intelsat IV F1/F3	Major Path 2 and lease service
24.6°W	Intelsat IVA F1	Primary Path
27.5°W	Intelsat IVA F2	contingency and lease service
34.5°W	Intelsat IVA F3	Major Path 1 and lease service.

Indian Ocean services are provided by:

57°E	Intelsat IV F5	available for lease service
57°E	Intelsat IVA F3	contingency and lease service
63°E	Intelsat IVA F6	Primary Path

Prepared from data supplied by:
Steve J. Birkill
128 Cross House Road
Grenoside, Sheffield
S30 3RX, England

And over the western Pacific:

177°E	Intelsat IV F8	Primary Path
179°W	Intelsat IV F4	reserve

The designations speak for themselves, though they may be changed from time to time to meet operational requirements, so should not be regarded as permanent. The orbital locations though are the ones allocated to Intelsat, and future birds will occupy nearby slots, if not the same traffic status. The **next generation** of Intelsats is the series **V** (five), the first launch of which is scheduled for September of this year (F2) with F1 (paradoxically) getting a December launch. Both of these will be positioned over the Atlantic, taking over Primary Path and Major Path 1 service from the existing IVAs. Two further Intelsat Vs, as Major Path 2 and a reserve, will be launched for the Atlantic region in 1981, together with further launches to serve Indian and Pacific Ocean regions.

Satellites in View

In the United States, you can sample Intelsat traffic in most places. The difficult spots are all of Montana and Utah, most of Idaho, Wyoming and Arizona, and parts of Nevada, New Mexico and Colorado, where all Intelsats are below 5 degrees elevation, as shown in **diagram 1**. The eastern states have the best selection, four Atlantic birds being visible. The principal US Intelsat terminal is located at Etam, West Virginia, with a diversity antenna located 22 miles northeast at Lenox, to combat weather-related atmospheric attenuation on the 14/11 GHz bands to be used by Intelsat V in addition to 6/4 GHz.

Having got an Intelsat in view, it should be remembered that, since Intelsat terminals are automatically steered, the satellites don't need to be maintained on station to quite the degree of accuracy required for a domestic domsat, and may be allowed to drift as much as 2 degrees before being corrected. All it means is that, with a high gain antenna fixed with boresight onto an Intelsat, the signal strength may well fall over a period of days, requiring re-peaking on the bird's signals.

Footprints

I often get requests for details of Intelsat footprints. The great flexibility of the Intelsat space segment makes a mockery of fixed footprint maps. For instance, Intelsat IV type spacecraft carry conical horn antennas for global coverage (17° beamwidcth to 3-dB points) and a **pair** of steerable paraboloid dishes to generate spot beams of 4.5° 3-dB beamwidth, which may be aimed to **any** point on the visible earth's surface. **Diagram 2** shows three **possible** aimings of spot beam coverage from an Atlantic Intelsat **IV**. These spot beams have some 11.5 dB gain over the global beam antennas, and are comparable with the US domestic footprint EIRPs. It will be realised that the 34 dBW is the saturated **beam-edge** value - **beam center EIRP is 3 dB higher**, but any back-off from saturation will **reduce** the EIRP.

The Intelsat IV spot-beams are ideal for communication with small terminals, which is one reason why the remaining **IVs** are **preferred** for **domestic lease service**, where typically TV programmes are distributed from one central point to several regional centers, each equipped with a small receive-only terminal, of perhaps 4.5 or 6 meters aperture. On an Intelsat **IV**, 4 transponders are tied to global beam transmitting antennas while the other eight are switchable by ground command between global beam and one of the two (east or west) spotbeam antennas. This arrangement has its disadvantages in that each spot beam can only look in one direction at a time. This meant that the spot beam capability was under-used on most of the Intelsat IVs and most of the switchable transponders **remained on** global beam of 22.5 dB EIRP.

When it became apparent that Intelsat V dual band system would not be ready before the end of Intelsat IV's useful life, a 'stop-gap' satellite was designed, based on the Intesat IV but with increased capacity thanks to **frequency re-use** within the 4 GHz band. At the same time the beam-switching facilities were improved to make the higher-EIRP beams more efficiently usable. The **four** 'global-beam-only' transponders were retained, but Intelsat **IVA** carried **eight extra transponders**, so that both eastern **and**

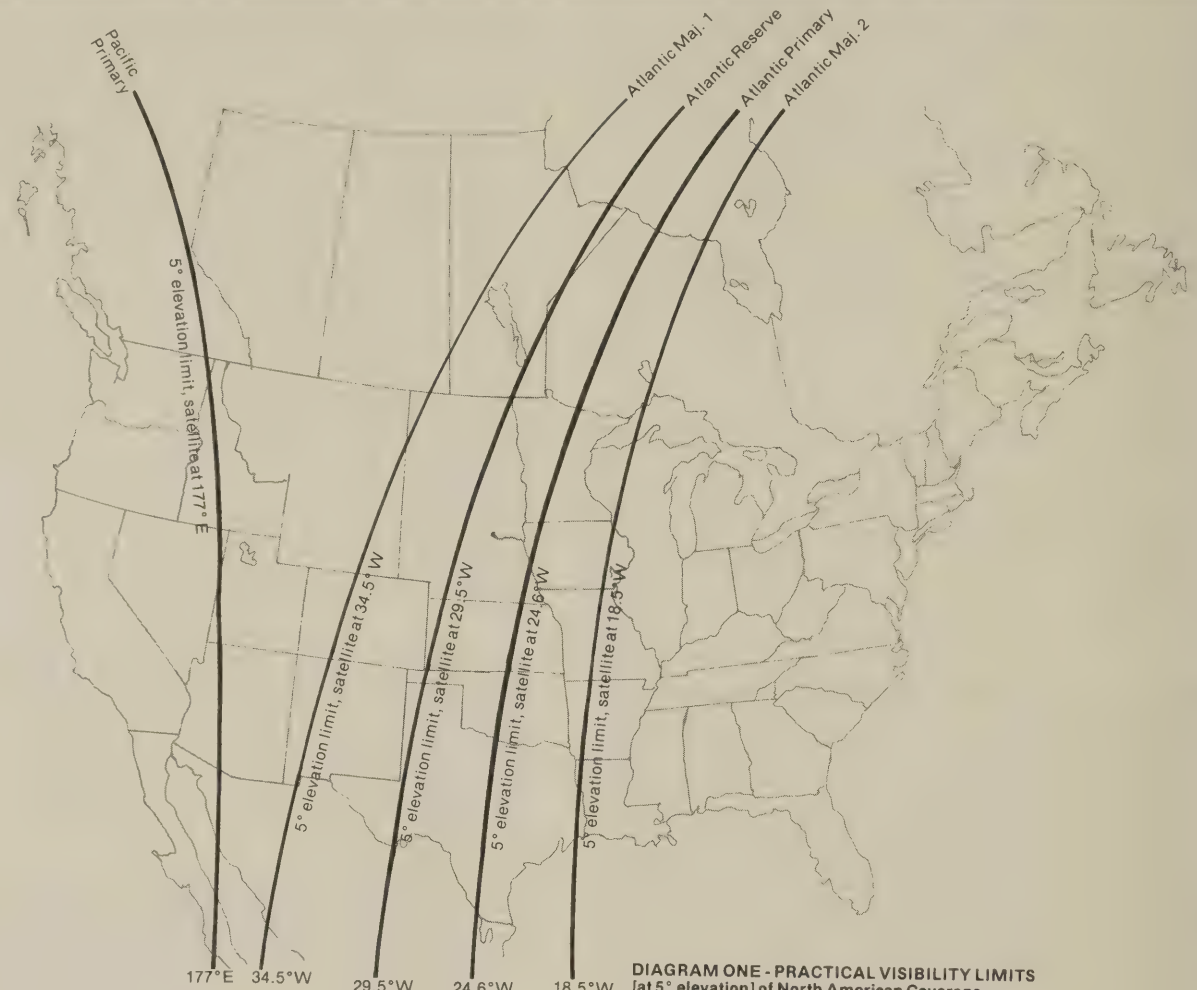


DIAGRAM ONE - PRACTICAL VISIBILITY LIMITS [at 5° elevation] of North American Coverage for Atlantic and Pacific INTELSATS.

western areas could be simultaneously covered using the **same** channel frequencies. The emphasis was placed on **hemispheric** beams, east and west, with the option to select **steerable spot beams**,though of lower gain (wider beam but lower EIRP) than the Intelsat IV spot beams. Comparing the two systems:

Intelsat IV:	
4 transponders global beam only	EIRP 22.5 dBW
4 transponders global or west spot beam	EIRP 22.5 **or 34.0 dBW**
4 transponders global or east spot beam	EIRP 22.5 **34.0 dBW**
Intelsat IVA:	
4 transponders global beam only	EIRP 22 dBW
8 transponders west hemi or spot beam	EIRP 26 or 29 dBW
8 transponders east hemi or spot beam	EIRP 26 or 29 dBW

-these EIRP figures again being beam-**edge**, saturated transponder values.

Diagram 3 shows the shape of the Intelsat IVA hemispheric beams for the Atlantic region, superimposed on a view of the earth as seen from 22,300 miles above a point on the equator at 24.6°W, the location of the Atlantic Primary Path satellite. The Indian Ocean footprints are shown in **diagram 4**.

With advent of Intelsat V later this year, a further level of frequency re-use will be added. In addition to the east and west beam separation, the same frequencies will be re-used in the same geographical areas by cross-polarising the hemispheric and zone beams (actually **opposite senses** of circular polarisation). **Diagram 5** shows the arrangement for again the 24.6°W Primary Path slot. **When** this comes into effect, there will be no possibility of using the signals **without** the **correct** circular polarisation feed, as a **linear feed** will be **unable** to separate the two cross-polarised transponders within the overlap zones. (**At present** all signals use **right-hand circular** polarisation). Also on diagram 5 can be seen the 11 GHz spot beams, aimed to encompass the locations of the heavy traffic Type C terminals operating in the 14/11 GHz bands (circuits between Europe and North America).

Frequency Plan

In diagram 6 I have compared transponder frequency assignments of the world's major 4 GHz downlink satellite systems. First the familiar domestic channels, the basic 12 as used by Anik and Westar, and the alternate-numbered cross-polarised 24 in the Satcom and Comstar arrangement. For comparison, I have also included the 6-channel, 50 MHz spacing Soviet system assignments, though **many** of their TV satellites are **only** active **on channel 5.**

The fifth group is the Intelsat plan. Unlike the domestic 12-channel arrangement, **telemetry** carriers are inserted **at band center**, between channels 6 **and** 7, thus moving the channel center frequencies away from those of the domsats.

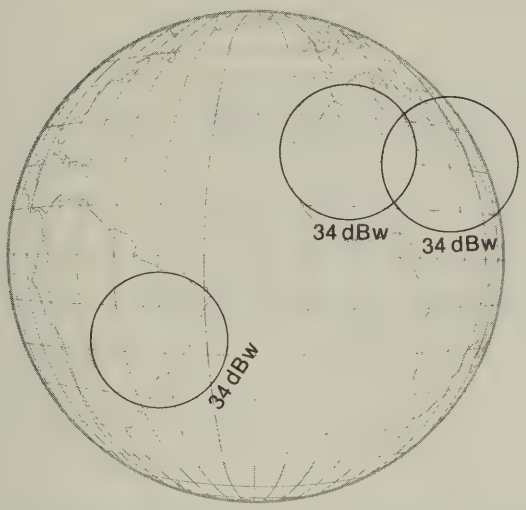


DIAGRAM TWO - INTELSAT IV TYPE SPOT BEAMS
(Possible footprints from Atlantic Satellite)

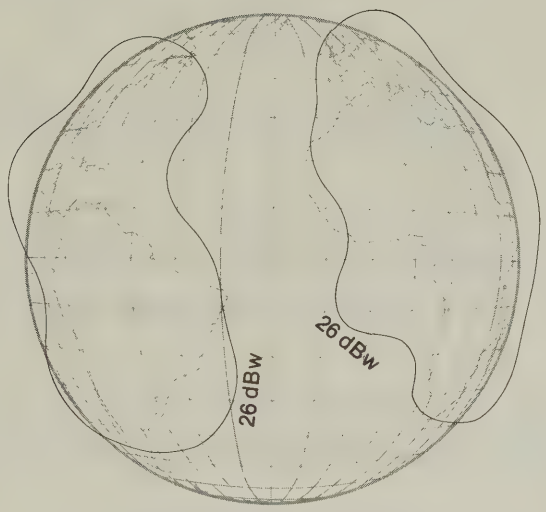


DIAGRAM THREE - INTELSAT IVA HEMISPHERIC BEAMS
(Atlantic Primary Satellite at 24.6°W)

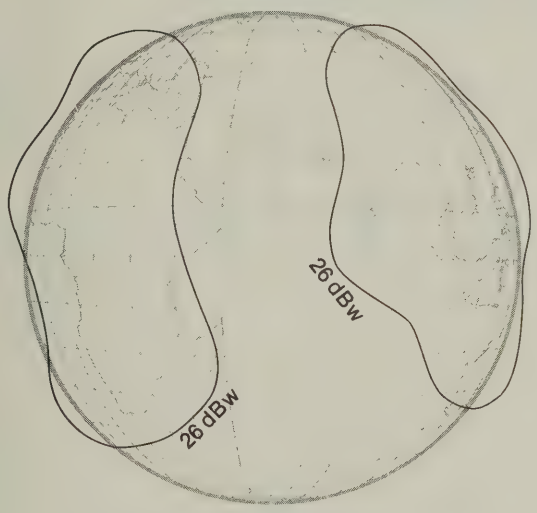


DIAGRAM FOUR - INTELSAT IVA HEMISPHERIC BEAMS
(Indian Ocean Satellite at 60°E)

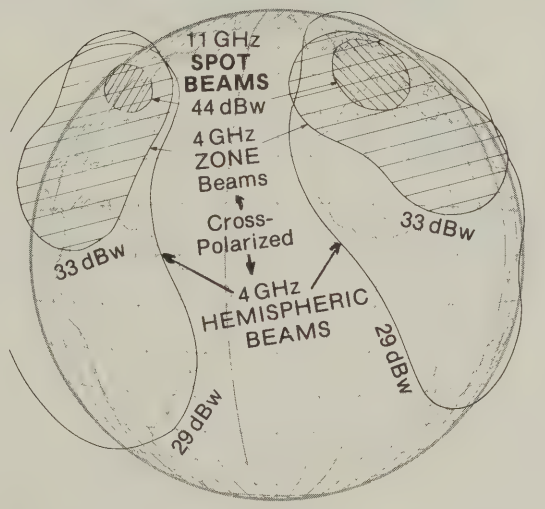
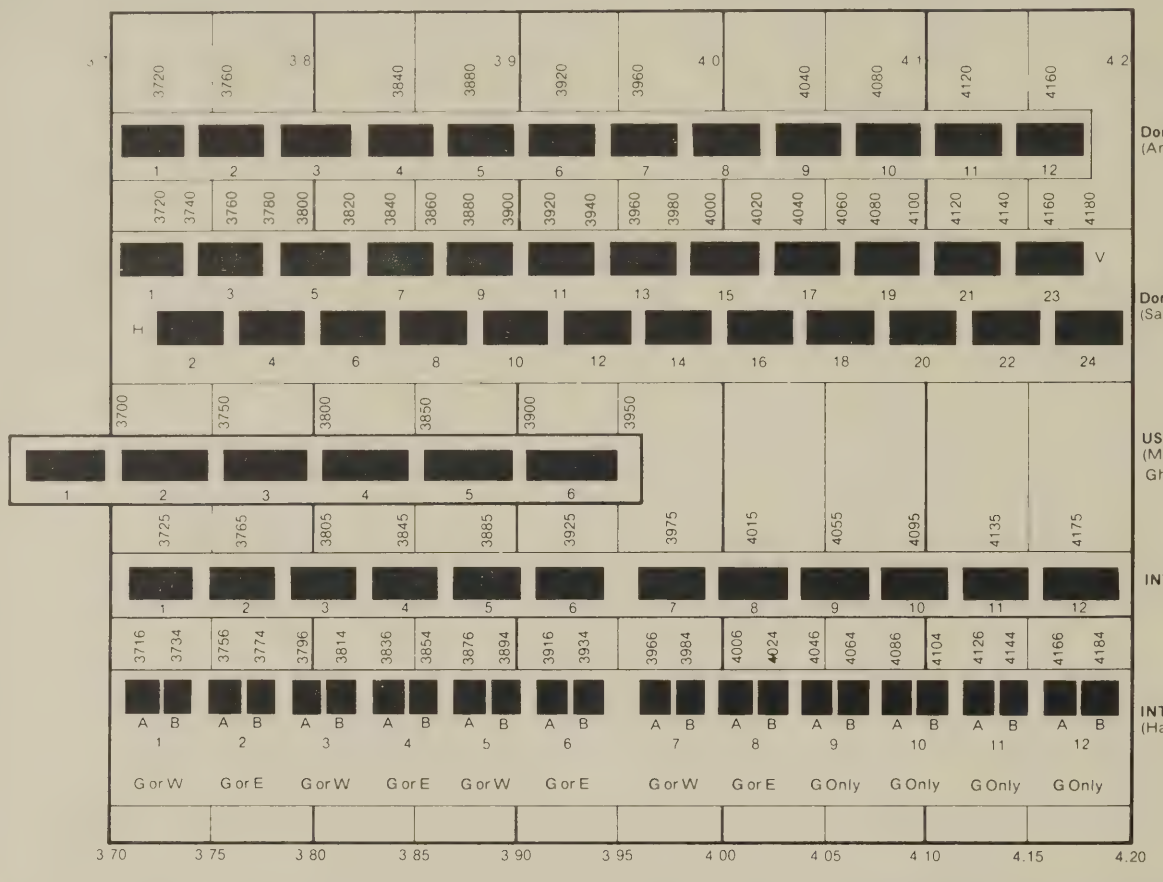


DIAGRAM FIVE - INTELSAT V FOOTPRINTS
(Atlantic Primary Satellite at 24.6°W)

Since the adoption of half-transponder working for television, the TV channel **center** frequencies assume perhaps more importance **than** transponder frequencies. For this reason the pattern is repeated, but divided into half-transponders, with TV carrier frequencies shown. Also in this lowest group is the identification of **which** Intelsat IV transponders can be **switched** from global beam **to** east or west spot beams.

Looking within the 36 MHz transponder bandwidth (**diagram 7**) we can see the effect of half-transponder TV working. A common arrangement in 'full-transponder' TV was to locate the TV carrier **3 MHz above channel center** and limit its bandwidth to a total of 30 MHz, leaving 6 MHz free to be used for cue circuits, engineering order wire circuits, and the all-important audio carrier or carriers. **With half-transponder TV**, TV channel bandwidth is maximised at 17.5 MHz, leaving only a 1 MHz guard channel between the 2 TV signals (of course, the other half of the transponder need not also be carrying TV, but a guard channel is still required.) One consequence of this is that now there's no room for (SCPC) audio. Particularly with leased channels (multiples of one quarter transponder) it's hard to fit the TV sound in anywhere else, so **increasingly** it is being **combined with** the video, usually in the subcarrier form familiar to domsat users. Popular subcarrier frequencies seem to be in the 5.8 or 6.55-6.65 MHz region. This of course makes our task easier, as we don't have to search around the edges of the transponder, or even other transponders, to find the audio.

Another consequence of half-transponder TV is that the full power is no longer available for the TV signal. Assuming two **identical** transmissions, each would claim **half** the **available** RF power, less a 'back-off' to reduce intermodulation between carriers to an acceptable value. So each TV signal must operate with a power perhaps **4 dB below saturation**, reducing for example Intelsat IVA global beam EIRP to 18 dBW, which sounds like a long way down. Some (but not all) of this loss can be recovered by optimising receiver bandwidth


3720 3760 3840 3880 3920 3960 4040 4080 4120 4160
Domestic (Anik, Westar, Palapa)
Domestic (Satcom, Comstar)
USSR (Molniya, Raduga, Ghorizont)
INTELSAT IV
INTELSAT IV (Half Transponder TV)
G or W G or E G Only
3.70 3.75 3.80 3.85 3.90 3.95 4.00 4.05 4.10 4.15 4.20

Note: G = Global, E = eastern hemispheric, W = western hemispheric Downlink Frequency (GHz)

DIAGRAM SIX - COMPARISON OF TRANSPONDER FREQUENCIES OF THE MAJOR 4 GHz SYSTEMS

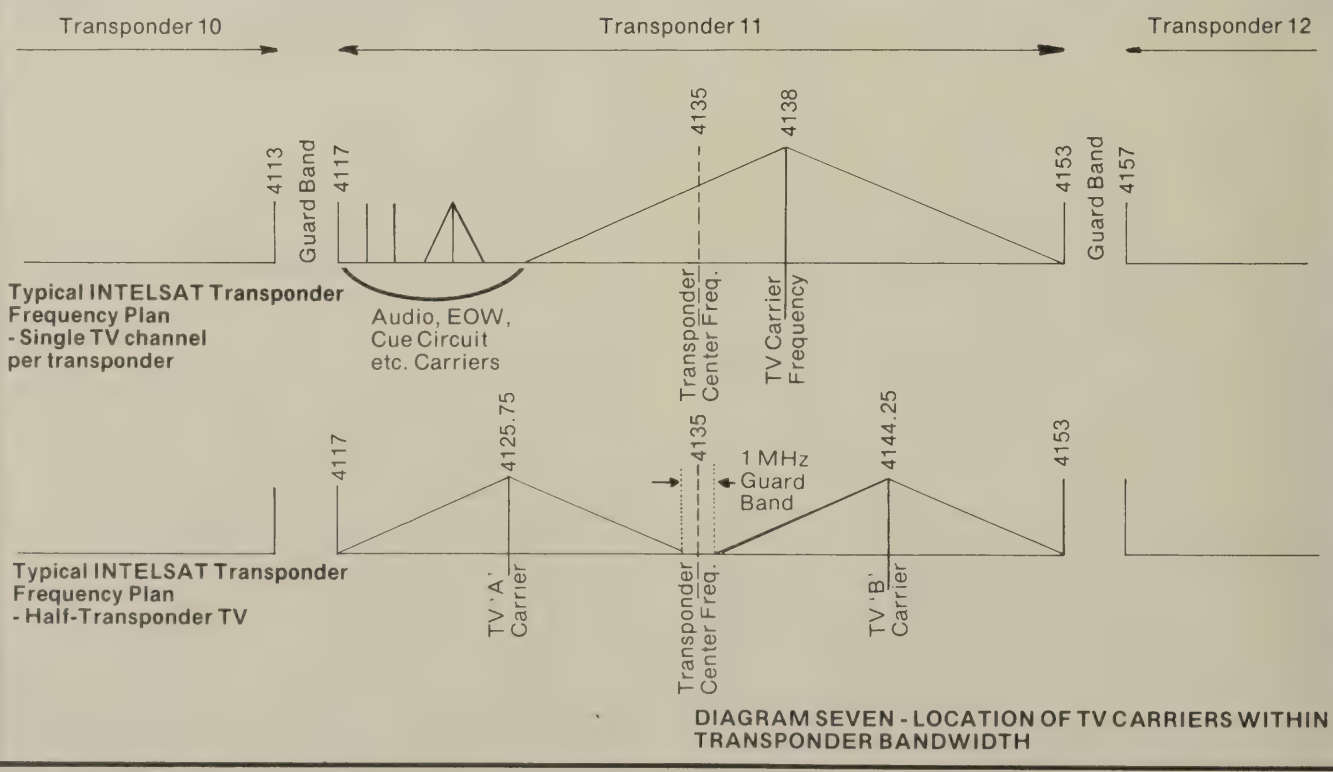


DIAGRAM SEVEN - LOCATION OF TV CARRIERS WITHIN TRANSPONDER BANDWIDTH

for the half-transponder format. I think **some** leased-transponder operators may have retained an option for full-transponder TV **for this reason**, but my observations are not conclusive.

TV Programming Available

Traditionally, 'live via satellite' international TV was used for immediate news items of world interest, including reports on state visits, summit conferences and the like, for live coverage of manned space exploration, and for the major international sporting events like the soccer World Cup and the Olympic Games. It was rare for more than one of these events to occur simultaneously, so provision was made within Intelsat for a main and a reserve TV channel. When TV was not required, the TV transponders would be available for other traffic. **Transponder 12 on the Intelsat IV birds** was made the **primary TV channel**, and most of the world's member terminals were equipped to handle TV signals **on this channel.** The next regular user of the TV facility came with the establishment of various international news exchanges. Items of international appeal would be provided to the satellite circuit by various broadcasters in turn, for recording and subsequent broadcasting by interested members. News services of this type are provided by Spain (the Ibero-American News Service), France (to locations throughout the world), Italy (the Eurovision news exchange originating in Brussels, Belgium, and also carried frequently by Russia's Intersputnik network), Visnes of London, England to destinations in the Far East and Middle East, and UPITN (news packages from the US to Japan five days per week).

Full-Time Leasing

In 1973, Intelsat began leasing satellite transponder capacity for domestic communications services. The low rates, (currently around $800,000 per transponder for 5 year contracts), combined with the low cost of small terminals made such leasing economically attractive to developing countries. One of the first to use the facility was Nigeria, with upwards of 20 stations linked through three leased transponders on the 'lease only' Intelsat IV at 1°W, over the Atlantic. Other African lessees are Algeria (one Indian Ocean transponder), Sudan (one Atlantic), Zaire (one Atlantic), Uganda (one Atlantic), and Egypt (one-**quarter** transonder). Further eastward, Saudi Arabia leases two and a quarter Atlantic transponders, and Oman a half Indian Ocean transponder. Also in the Indian Ocean region is India (¼ tpdr). Pacific leases are held by Malaysia (1), the Philippines (1½) and Australia (2 transponders). Norway uses Atlantic capacity to maintain communications with its North Sea oil platforms (½ tpdr), France has ¾ Indian to provide its link with Saint Denis de la Reunion, and Spain transmits TV to the Canary Islands via a half Atlantic transponder. Greenland leases for communications with Denmark, and in South America, Atlantic quarter-transponders are leased to Chile, Colombia and Peru, while Brazil leases a massive 2½-transponder chunk of space segment.

Not all these leasings are used for TV - **nothing less than** a half-transponder **can accommodate** a TV channel - but where TV programs are carried they can be relied upon to be more or less permanently available. Contingencies may demand transfer to a different satellite in the same Ocean region,but the transponder frequency will in general remain the same. (Frequency-agile receivers are the **exception** out there in bush-terminal land - it's one thing to move the antenna onto the next bird, five degrees away, quite another to equip 20 remote stations for a **new** channel frequency!) It's not possible to give complete listings of what services to find on which transponder on which bird, but having the list of Intelsats visible from your location, and having a fully tunable receiver such as described in STT's various manuals, it's not too much of a problem (and can be a lot of fun) to acquire each available bird in turn and run through the 3.7 - 4.2 GHz band, noting what is available at each tune point for future use. It may be necessary to stick with a TV channel for an hour or two to positively identify its source, but it's worth the effort. Don't be surprised if there's **only one or two TV channels** on each satellite - these will probably be the permanent ones, the 'occasional video' transponders being in use for other traffic. Realise also that the 'opposite hemisphere' beam (Intelsat IVA) to the one you're in can never be received, so if for instance you're in the USA **and receiving** TV aimed at an **African** destination, it'll most likely be **a global** beam. Similarly, EIRP falls off sharply outside the spot beams - none of those shown in diagram 2 would be usable in the USA. Also, what I see here in Sheffield will include a large amount of east hemisphere IVA Atlantic beams, **not available** across the pond. American experimenters will likewise have access to services I've never seen, though we may view the same Atlantic birds. Certainly Brazil TV was easily received at SPTS-80 Miami (see report in March issue). Readers in Africa and the Middle East should find a plentiful choice of TV programs, but I suggest they make a search of the available channels to find out what is available at **their** location. **CSD** will publish all findings. (I believe there are several sophisticated 'private terminals' in the wealthy Middle-East oil states, that are even now used **just for viewing** the variety of Intelsat TV programs.)

BIRD OPERATIONAL NOTES

DECISIONS to participate in direct-broadcast satellite services in 12 GHz band appear to have been made by Finland, Norway, Denmark and Sweden. Proposed service would have 8 channels operational for these countries; an additional five to cover Iceland, Faroe Islands and **possibly** Greenland. Service to latter might be 'above horizon' and at useable level in parts of northeastern Canada. If final decision is made, service could be operational by late in 1985.

RCA in application to FCC seeking authorization for launch of SATCOM IV **projects** 44 transponders will be needed fulltime for just cable TV industry by 1984. When number of video transponders to be required by same time frame for broadcasters and networks is added, RCA sees need for 80 fulltime transponders.

OAK claims it has solved the satellite 'theft' problem; has demonstrated system on WESTAR which it says will cost uplink site between $5,000 and $50,000 per video channel; will cost each downlink terminal between $500 and $1,000. OAK suggests prototype gear available by end of 1980; full production by end of 1981. System works by addressing decoders at specific locations (via satellite fed signal).

PBS may launch test of direct satellite fed translators from WESTAR I fed channels in state on Montana before year is out. Decision is close, likely.

AFTER SEARS and COMSAT fell apart there has been speculation that COMSAT will try to announce a replacement partner for much-promoted DBS bird system. Current rumors include Montgomery Wards and Radio Shack in list of potential partners.

TED TURNER's Cable News Network ready to begin service on temporary transponder 14 home on FI June 1st with first 24 hour per day news service. Previous **speculation** that transponders 15 or 19 might be utilized for service apparently incorrect; transponder 15 is most heavily loaded SCPC/data/audio satellite channel in sky these days involving hundreds of customers; transponder 19 has previously unreported 'noise problem' and is not capable of handling video service. Transponder 14 may be a bummer none the less - in past it has

been intermittent.

SAME INTERMITTENT problem has been cropping up repeatedly on Trinity's transponder 13; may be combination of unfortunate uplink transmitter plus bird problems. Occasional outages on transponder 5 of late are apparently result of uplink transmitter, not bird itself.

UNKNOWN California firm called Orrox Corporation (Santa Clara) reportedly has received license from NHK Japan to produce 12 GHz receive terminal electronics; they say packages will sell in ''$300-$500 range...''.

LATEST new programming service to announce plans to package materials for cable market is Las Vegas Satellite Network. Firm plans September start, will provide 3 hours per day of programs live and taped from LV nightspots; format would be on COMSTAR D2 transponder 19 (V).

SCRATCH one of the 'lucky' firms to 'win' a COMSTAR D2 transponder in RCA lottery; Total Communications won transponder 22 (H) in April drawing, subsequently has 'sold' rights to it to Warner-AMEX (operator of The Movie Channel, KTVU and Nickelodeon on FI).

QUESTION. When are all of these D2 programmers likely to start service? Best bets are late fall before anyone shows up there on **regular** basis. Some 'tests' are likely before then, but don't expect **much** activity on D2 before early in 1981. Remember all of those who ended up there are simply biding time (and paying rent) until RCA gets the FIII replacement up and operating late in 1981.

STRANGE press-release announcement from Scientific-Atlanta, after firm bowed out of 'home TVRO system sales' last fall. They have named new ''Video Products Division'' to handle marketing of earth stations to ''...hotels/motels, hospitals **and homeowners**...''.

WASHINGTON, D. C. gets its first fulltime Spanish language television this month; via satellite. Channel 56 UHF translator (1 kW) will pick off WESTAR II SIN feed and rebroadcast in market.

NEW NAME for Madison Square Garden Events/ Calliope (children's network) is USA NETWORK. Service on transponder 9 has been on for several years, will expand to 'routine 8 hour day' in September.

NEW national satellite delivered 'all sports radio network' called Enterprise Radio will become available early 1981 according to announcement. Service will be on a yet-unnamed WESTAR satellite (SCPC) will use two audio channels, package 800 number toll free call-in sports talk shows with live coverage of sporting events plus pair of detailed sporting newscasts per hour.

YOUR neighborhood Holiday INN, now carrying HBO via satellite, is adding WTBS for off-HBO hours and is negotiating with ESPN for transponder 7's all sports coverage.

SUGAR RAY LEONARD-DURAN fight scheduled for June 20th one of best kept satellite secrets in years. Fight will be sent via satellite, reportedly will be carried by at least Columbus, Ohio CATV ystem (for a per-event fee). Terminal operators in Bahamas, elsewhere tried without success to contact promoters to buy rights to exhibition in their country.

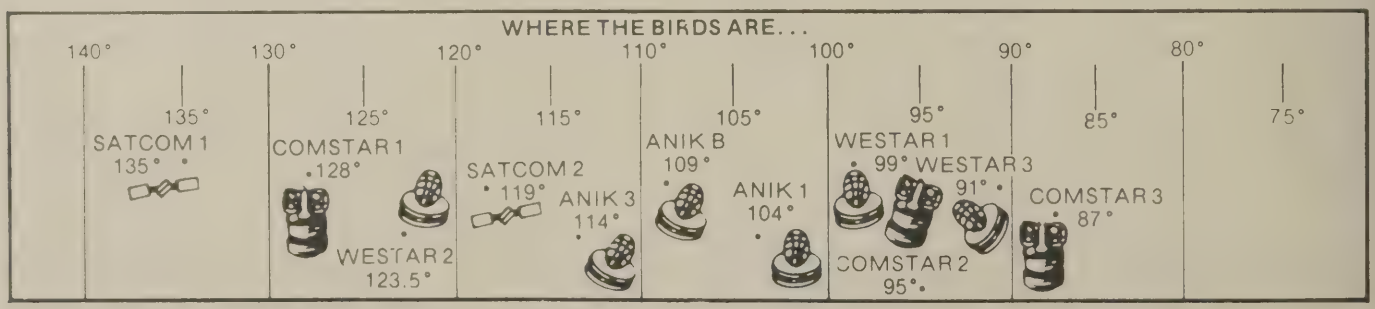
JUNE CES (Consumer Electronics Show) in Chicago will have at least two TVRO terminals operating as exhibits; first opportunity for many of the nation's retail electronic dealers/distributors to witness what the private terminal revolution is all about.

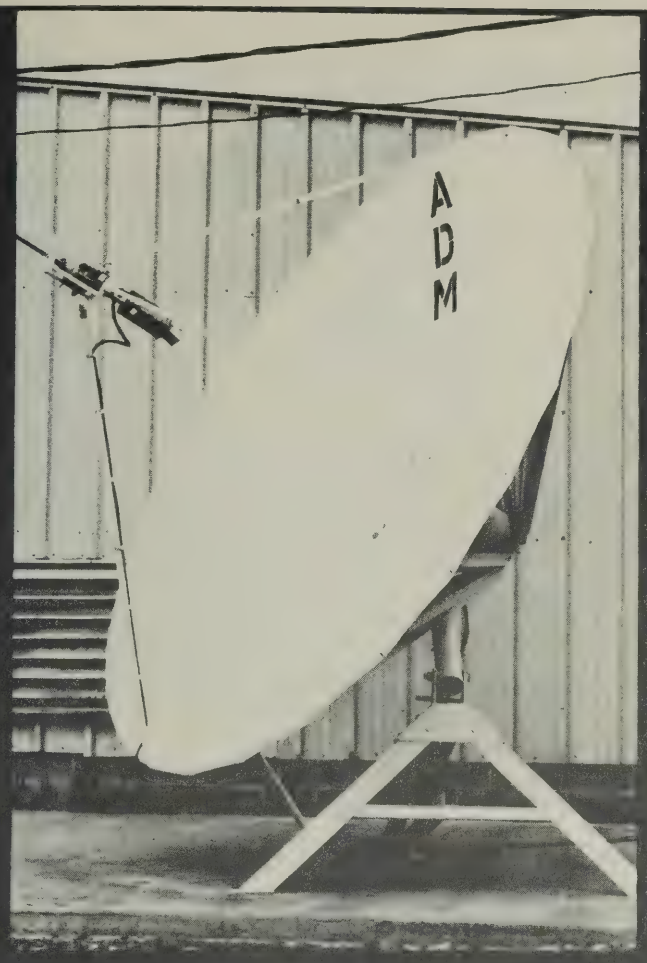
IN SURPRISE announcement CBS Network said it was expecting to create a special cable television division, might even create a special cable program **network** for distribution via satellite. One week after surprise announcement the CBS executive who made the announcement was suddenly dismissed from job. Two may not be related.

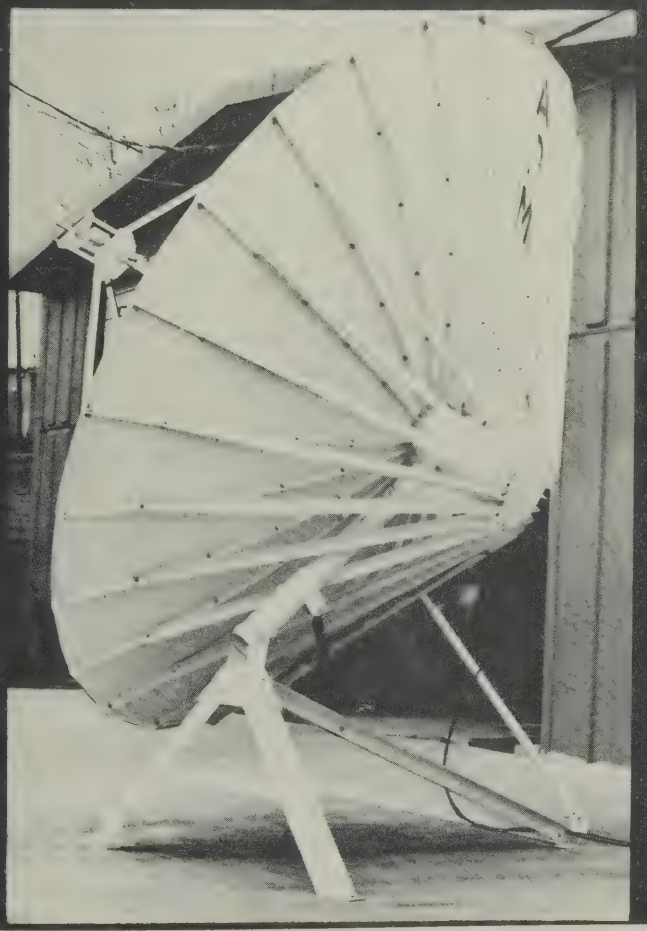
JUNE 9th is start date for new Independent News Network (INN) chaired by New York City's WPIX. News feeds from 9:30 to 10:00 PM eastern via WESTAR satellite link weekdays will likely air in local markets after 10:00 PM.

INDEFATIGABLE Fred Hopengarten of high-dollar TVRO distributor 'Channel One' continues to find his way into headlines. First he agreed to argue on panel at mid-May National Cable Television Association convention that everyone has a legal right to '**steal**' anything on satellites he wishes; NCTA back peddled shortly after announcing Hopengarten appearance deciding they didn't want to give him any forum for his views. Then June issue of **RADIO ELECTRONICS** carries error-filled one page article by him reporting (among other mistakes) that motorized TVRO antennas are **very** expensive, antennas **must** be shielded from wind 'because they are like sails', that if you want to operate as a CATV system you **must** have frequency coordination for your terminal, and that to add a second receiver to a terminal you **must** add a second LNA.

Quick-Satellite-Facts: Audio subcarriers currently in use on SATCOM FI are as follows. Transponder **3** - WFMT (stereo clasical music) is on 5.8 MHz. Transponder **6** - UPI News and Slow Scan is on 6.2 MHz while Easy Listening Music is on 7.4 MHz. Transponder **21** - The Disco Network is on 5.8 MHz while Seeburg Background Music is on 7.4 MHz. **Program control tones** are as follows: Transponder **5** (Movie Channel) turns on east/central receivers with 311 * # and west with 519 * #. Transponder **9** (Madison Square Garden Sports) turns on with 438 * #; Calliope turns on with 168 * #; C-SPAN turns on with 195 * #; and, BET (Black Entertainment Television) turns on with 018 * #. Transponder **10** (Showtime) turns on with 576 * #. Transponder **11** (Nickelodeon) turns on with 749 * #. Tranponder **12** (Showtime) turns on with 576 * #. The Mini-Pay service (Front Row) on transponders 10 and 12 turns on with 481 * #. On transponder **21** SPN utilizes 429 * # while HTN (Home Theater Network, 8-10 PM eastern) utilizes 207 * #. On transponder **22** Modern Satellite Network utilizes 421 * # while HBO (west) utilizes 835 *#. On transponder **23** (HBO's Take-2), they use 529 * # for the eastern two time zones and 681 * # for the western two times zones. Transponder **24** (HBO east) utilizes 835 * #. RCA owned and operated uplinks include Atlanta (not supposed to have video although it has been seen). Vernon Valley (N.J.), Chicago (Lake Geneva), Los Angeles (South Mountain), San Francisco (Point Arena), and Houston. Western Union owned and operated uplinks include Glenwood (N.J.), Chicago (Lake Geneva), Los Angeles, San Francisco, Dallas, Seattle, Phoenix, Atlanta and Honolulu. ATT-GTE uplinks include New York City, Chicago, Tampa, Atlanta, Honolulu, San Francisco and Los Angeles. PBS uplinks include Washington, D.C., Denver, Columbia (S.C.), Lincoln (NB), Hartford (CT) and Talahassee (FL). Independent uplinks include Appalachian Regional Commission (Lexington, KY), C-SPAN (Washington, D.C.), ESPN (Bristol, CT.), Southern Satellite Systems (Atlanta, GA), SIN/Galavision (Los Angeles), CBN (Virginia Beach, VA), PTL (Charlotte, NC), Satellite Systems (Buffalo, NY), KTBN/Trinity (Los Angeles and SIN (San Antonio, TX).







ANYWAY YOU LOOK AT IT...

ADM HAS YOUR ANTENNA!

AND YOUR TVRO SYSTEM. Rapid delivery on ADM's super-efficient 11 foot polar mount antenna (includes remote controlled polarization rotation system as well!), plus, packages are available for complete systems including LNA, 24 channel tuneable receiver and cabling. Why wait in a long line when you can get the best, today!

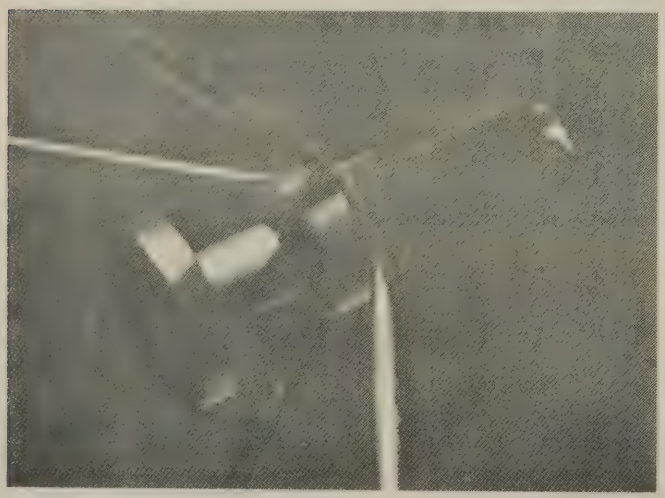
A SUPER TVRO ANTENNA SYSTEM. High quality panelized aluminum 11 foot dish and steel polar mount. Dish weighs approximately 200 pounds, mount 265 pounds. Precision designed, easy installation, zinc chromate base primed and heavy duty white top finish. The rotating feed is standard! Easily shipped and installed. Choice openings for dealers and distributors.

Antenna Development & Manufacturing, Inc.

P.O. Box 1178
Poplar Bluff, Mo. 63901
(1-314-785-5988)

CHAPARRAL COMMUNICATIONS

CHAPARRAL produces high quality parabolic antennas constructed of precision-made aluminum petals on an extremely strong rim structure of aluminized steel tubing. All rim segments are self-aligning to form a rigid support structure for the petals which are also self-aligning through precision-located holes. No adjustments or alignment fixtures are ever required. **Chaparral antennas** are designed for low-cost even in small quantities. Low-cost shipping means the 10 foot antenna weighing 160 pounds can be shipped via UPS anyplace within the USA for less than $60! It is packaged in four boxes that easily fit into the trunk of a standard sized vehicle. Two men can assemble the antenna in about four hours time.



10 FOOT ANTENNA - The model 1016 is a sixteen section 10.5 foot diameter antenna having a gain of 39.5 dBi at 4.0 GHz with the Chaparral Feed (see below). Including polar mount, Chaparral Feed **and** polarization rotator. Extender petals increase the diameter to 12 feet and increase the gain by 0.9 dB.

12 FOOT ANTENNA - The model 1218 is an eighteen section 12.0 foot diameter antenna having a gain of 41.1 dBi at 4.0 GHz with the Chaparral Feed (see below). Including polar mount, Chaparral Feed **and** polarization rotator. Extender panels increase the diameter to 14 feet and increase the gain by 0.9 dB.

CHAPARRAL FEED - The Chaparral Feed was designed for the Chaparral Antenna(s) by Taylor Howard. Extensive testing on the range and on antennas (from .38 to .45 f/D) has shown that this feed improves the gain of Chaparral Antennas by 0.5 dB over the 'standard' feed horn. This feed will improve the performance of **your antenna** also. It features two-piece aluminum construction with one casting and has the standard CPR229G flange.

POLAR MOUNT - The Chaparral Polar Mount is usable in latitudes from 25 to 50 degrees and the polar axis provides an hour angle of +/- 70 degrees.

DELIVERY-Stock to 30 days ARO;see us at SPTS'80

CHAPARRAL COMMUNICATIONS

P. O. Box 832
Los, Altos, CA 94022
(415/941-1555)

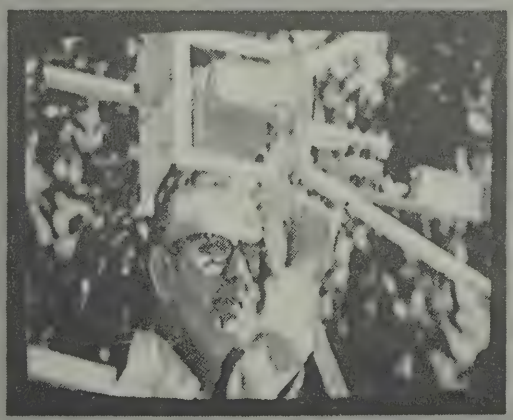
© 1980 Chaparral Communications Co.

INSIDE THIS ISSUE

Red Photons On Our Heads
FROM RUSSIA WITH LOVE
Find The Bird
THE SATELLITE NAVIGATOR
Those 4 kHz Channels
THIS IS KFQD, ANCHORAGE
How Does It Work?
SAT—TEC RECEIVER REVIEW

COOP'S SATELLITE DIGEST

JULY 1980



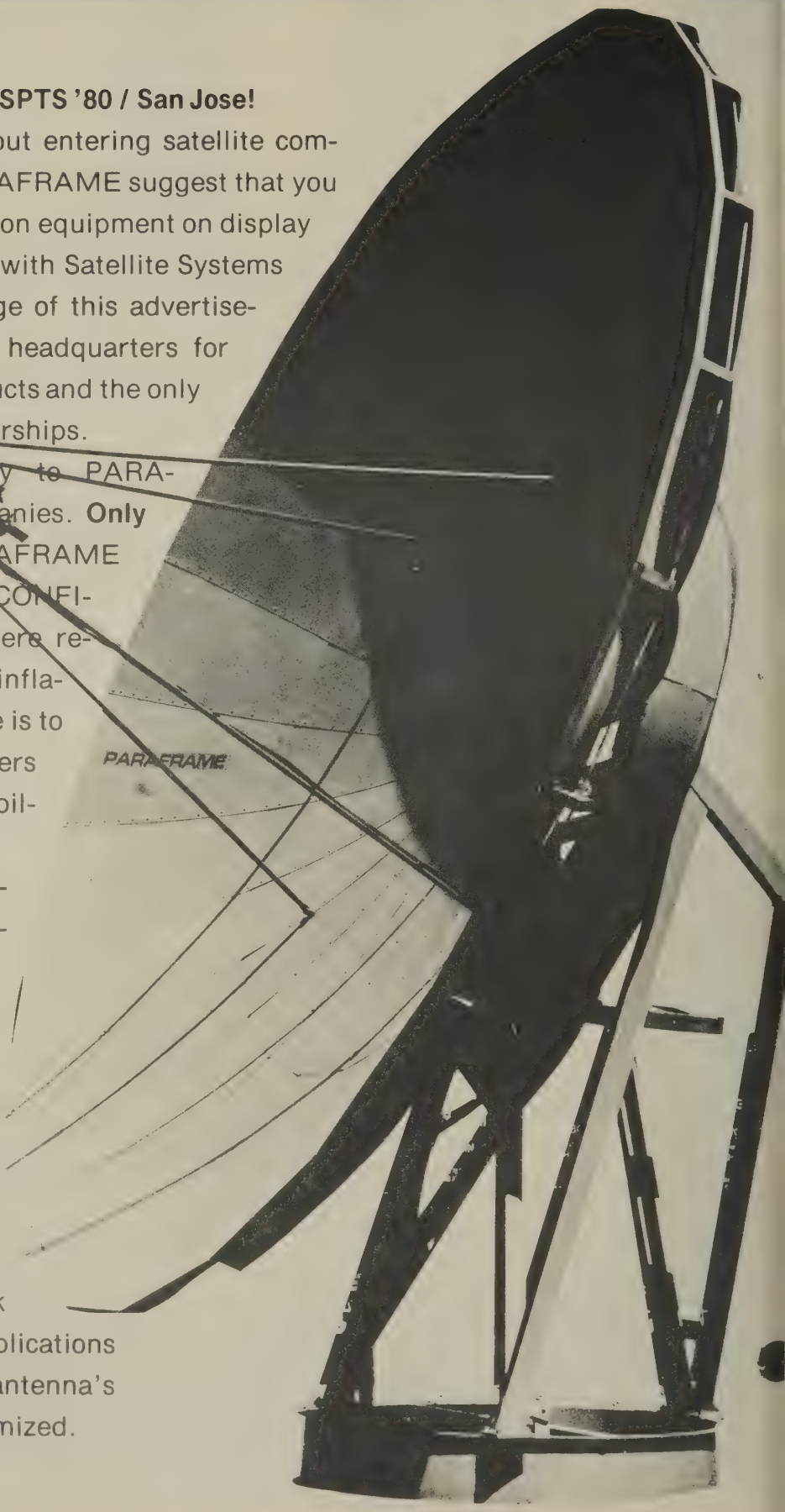
PARAFRAME

PARAFRAME, INC. welcomes you to SPTS '80 / San Jose!

If you are thinking seriously about entering satellite communications as a business, we at PARAFRAME suggest that you carefully examine all of the earth station equipment on display at SPTS. **Then** make an appointment with Satellite Systems of Illinois (address on right hand page of this advertisement) to visit PARAFRAME, INC.; headquarters for **professional-grade** earth station products and the only manufacturer offering protected dealerships.

PARAFRAME, INC. sells only to PARAFRAME dealers and/or CATV companies. **Only** PARAFRAME dealers can buy PARAFRAME products at dealer prices, which are CONFIDENTIAL. With the economy in severe recession (combined with outrageous inflation) we think the most prudent course is to build equipment of lasting value for users who understand that quality and durability are hedges against inflation.

PARAFRAME antennas are unique; they have an adjustable superstructure or **parabolic framework** which is now **patented**. PARAFRAME antennas are adjusted and 'proofed' **on site for maximum real world gain**. Our antennas are adjusted to conform to a parabolic proofing gauge known as the PARAFRAME Proofing template. The PARAFRAME Philosophy dates back to our early work with scientific applications (i.e. radio astronomy) where every antenna's performance must be known and maximized.



PARAFRAME

PARAFRAME antenna feature precision aiming mechanisms of silken-smooth, backlash-free operation. PARAFRAME aiming mechanisms are totally repeatable.

PARAFRAME antennas are presently manufactured in two sizes: 3.66 and 4.85 meters.

To learn more about PARAFRAME antennas and earth station products, and how to become a protected PARAFRAME dealer, contact:

Bob Christofanelli
Satellite Systems of Illinois
P. O. Box 68
Steger, Illinois 60475
Phone 312-755-5400

These companies have joined the PARAFRAME Family of Protected Dealers:

Mid-Continent Earth Stations
P. O. Box 81673
Lincoln, Nebraska 68501
Phone 402-476-2211

Tower Enterprises, Inc.
442A West Pike Street
Clarksburg, WV 26301
Phone 304-623-3238

Jerry Peake Company, Inc.
2328 Montgomery Street
Silver Spring, MD 20910
Phone 301-587-2515

PARAFRAME

PARAFRAME, INC. - Box 423
MONEE, ILLINOIS 60499

COOP'S COMMENT ON TECHNOLOGY

SOFTWARE INTERFACING

In anticipation of successful acquisition of the Russian Molniya satellite system STT had been looking around for someway to do high quality conversion of the Russian SECAM color standards to an (American) NTSC standards receiver as early as last fall. Then we ran across a Sony Video Products handbook which listed on page 41 just what we were looking for. In fact, we passed this information along to readers of **CSD** in our March 1980 issue (page P13) when we noted:

> **"...the various video standards in use in the world today are at best confusing to those of us brought up on NTSC color. Sony markets a standards-switchable monitor** (PVM-1850PS) **which allows you to switch between PAL/SECAM/NTSC. That's one approach to being able to resolve** (in color) **anything the birds throw down to you."**

For the record, we ordered such a machine and we relied upon the Sony Video Products handbook being accurate when we ordered this monitor. We reproduce without fear of copyright violation the applicable segment of that handbook here.

PVM-1850PS
Trinitron® Color Monitor

• Exclusive Trinitron one gun/one lens color system provides superb color in an unusually compact, lightweight unit • Reproduces video and audio from NTSC, PAL and SECAM signals • Video and audio IN/OUT connections for loop-through systems

When we first acquired the Russian signals we tried the monitor out; it had been in a box after arriving, without check-out, since we have no real need for another NTSC monitor these days. We should have been suspicious of Sony's claim I guess, even their '**lightweight**' claim in their text falls apart when you lift the nearly **72 pounds** off the ground!

Well, the monitor didn't resolve Russian color. In fact, it didn't resolve Russia at all. Further checks revealed it would not resolve the Brazilian PAL signals. In desperation we tried it on NTSC color and found only black and white. At this point we went back to our Sony dealer in Oklahoma City (Industrial Video, Inc.). They wanted to return it to Sony for **repair** but we thought perhaps that would be a waste of time unless we first determined what it was the monitor was really **supposed** to do. After some frustration trying to find someone (**anyone**) at Sony that even knew there was such a product in the line, we arrived at the truth. On the chance that you are considering purchasing a Sony monitor that resolves PAL/SECAM/NTSC color video we pass along the following to you as a warning.

The Sony PVM-1850PS is not for you. As far as I know, there is no monitor built in the world today that will (as a monitor) allow you to switch between the various PAL/SECAM/NTSC standards. Russian SECAM is a 625 line / 8 MHz bandwidth (6 MHz video with audio 6.5 MHz higher) / negative modulation of video / FM audio system. The French, who invented SECAM, use two standards; their 819 line format is 14 MHz bandwidth / 10 MHz video with the audio + /- 11.15 MHz (video is FM) and their audio is AM (!). Their more common European PAL approach is 625 lines / 6 MHz bandwidth (video is 4.2 MHz wide) / audio is 4.5 MHz higher / video modulation is positive and the audio is still AM. The United Kingdom PAL format is 625 line / 8 MHz bandwidth (video is 5.5 MHz wide) / audio is 6 MHz higher, video is negatiave and the audio is FM. The Brazilian PAL format is 525 line / 6 MHz bandwidth (video is 4.2 MHz wide) / audio is 4.5 MHz higher FM and the picture is negatively modulated.

There are 14 different standards **in the world**. A real switchable standards monitor would need 14 different switch-selected sets of video processing.

The PVM-1850PS does none of this. **Which** SECAM system it works on I can't say. **Which** PAL system it works on I also cannot say. NTSC? Well, it turns out Sony has something unique to Sony; a 'modified' NTSC format which only slaves to a special VO-2630 PAL/SECAM/NTSC 3/4 inch deck system. "This (modified) NTSC system" unique to Sony might be considered the world's "15th standard". Good grief.

My Sony dealer took back the PVM-1850PS and gave me full credit. But Sony refused to take it back from him. **I think that stinks.** Especially when Sony's latest 'handbook' slides a new world ("**modified**") into the all too brief text that extolls the virtues of the 1850PS.

provides superb color in an unusually compact, light-weight unit • Reproduces video and audio from modified NTSC, PAL and SECAM signals • Video and audio

Before I gave up on Sony I tried to find out if they manufacture monitors for export to the USSR thinking that would be one way to be sure of getting a Russian standards picture. Alas the Sony guy in Dallas told us we shouldn't be **trying** to receive a Russian signal "because it has 819 lines". Good grief again. In disgust I gave up on Sony in spite of the fact our full production and editing system is Sony and in that area I love 'em to death (i.e. we are very happy with their products). Be warned. Standards conversion is no piece of cake.

COOP'S SATELLITE DIGEST (Technology Section) is published monthly by Robert B. and Susan T. Cooper doing business as Satellite Television Technology (Ltd.), P.O. Box G, Arcadia, OK 73007 (USA); 405-396-2574. **CSD** is not affiliated with any satellite programming distributor, hardware (equipment) manufacturer or distributor nor satellite systems operator. STT sponsors the Satellite Private Terminal Seminars (SPTS) held three times per year and does produce and distribute 'learning' materials and 'how-to-do-it' manuals relating to the development of the low-cost satellite TV receiving system industry. Subscription fee is $50 (US funds) in advance Canada, US, Mexico; $75 (US funds) elsewhere. Copyright 1980 by Robert B. and Susan T. Cooper.

ACCURATE BIRD TRACKING WITH THE SATELLITE NAVIGATOR

SURPLUS model 916AL generator and a coffee can antenna makes a dandy satellite simulator.

BONUS...PREDICTING SUN TRANSIT OUTAGE!

Perhaps you know by now from the literature that the sun gets **directly behind** each satellite about twice a year. The weak transmitter power of the satellite is no match for the sun and your receiver, to use a TV phrase, **takes black**! The signal will disappear for a period of time (dependent on many factors but mostly due to the beamwidth of your antenna). If you run a TV station or a Cable system, then solar outage can be better tolerated if you at least know when to expect it. To anyone else, it's good to know when your system may start to act up.

It's hard to know precisely when solar outages will happen unless you are an astronomer or know something about marine navigation tools. But wait! The sun will have the azimuth and elevation as the satellite at the time of an outage. Aha! If we know when the sun will have the same coordinates as the satellite, we can predict the exact moment of the outage.

All you need to do is scan the **STT Sun Shot Chart** for your latitude and note the time when the sun has about the same azimuth and elevation as the satellite. Easy isn't it?

FINE TUNING TECHNIQUES REVEALED

At this point, if your equipment is working properly and you are tuned to a working transponder, you should see some kind of a picture. I say 'should' because other variables are involved such as 'sun outage'. Of course you can verify that by simply looking at the shadow cast by your LNA feed point. Other problems you might have are that you may be tuned to a vertically polarized transponder while your antenna feed is horizontally polarized. The test for that possibility is simple enough, but you must remember to test one thing at a time. Too often you can fool yourself by changing parts or making more than two adjustments at a time. **This is clearly a no-no** because you can unknowingly cause something to stop working which now puts you in the very unhandy position of having more than one variable to control to get a picture.

Let's say you **know** the equipment is working and you **know** the dish is aimed as best as the accuracy of our simple instruments will permit. What then? Remembering that we must change only one thing at a time, we can gently sweep the dish a few degrees left and right of what we believe is the proper azimuth angle. Small adjustments are safer and while it will be very hard to contain your excitement, it is known from the experience of scores of antenna installers that you must go slowly to achieve rapid success.

If you still haven't received a picture, then you must restore the antenna to your best estimate of the azimuth angle and begin to adjust the elevation angle in small increments. **One adjustment at a time is the key.**

An alternative method is to **slightly** adjust the elevation and then re-sweep across the azimuth position. This practice is **repeated** for various elevation angles that are very near the calculated values. It is best to start at an elevation angle on one side of the predicted value and work your way through it each time gently sweeping the antenna a few degrees on both sides of the predicted azimuth values. You must be careful not to move the antenna in too large jumps in the elevation plane or you might miss the bird when you sweep the azimuth plane.

The measure of your ultimate success at this point will be totally up to your partner in this project...none other than Edsel Murphy. You may remember him as that fabled seer who said "**If anything can go wrong...it will**". Ridding your TVRO of Edsel Murphy's influence is the bane of all satellite pioneers. If he has graced your station with a visit, then it's time to adopt stronger measures.

It's best to start over by first checking your equipment for proper tuning and cable connections. An easy way to test your entire antenna/LNA/receiver set-up is to simulate a satellite signal by connecting the output of a microwave signal generator to a small antenna and pointing it at your dish.

ABOUT THIS REPORT -

At SPTS '80 in San Jose STT is releasing a trio of new manuals. One, authored by Stephen Gibson of Los Angeles, offers the satellite student the first complete textbook on satellite antenna mounting systems, 'navigation' [the art of finding satellites quickly] and automated dish control systems. From that new STT manual we present this 'extract' because we think Gibson's experience, knowledge and tips in the antenna mount area deserve the widest possible distribution.

By
Stephen Gibson
Gibson Engineering
547 North Beachwood Drive
Los Angeles, CA 90004

Coffee cans make dandy 'horn' antennas as seen here. The probe antenna is about 1 inch long and positioned on the end (center pin) of an 'N' connector located about 1 inch from the rear of the can. Your TV screen should **go black** as the generator falls within the lock-in range of your reciever.

Perhaps an easier test instrument is the 'Freebee Photon Source'...the sun. Just swing your antenna around and point it at the sun. A noticeable increase in noise should be seen **immediately** as you swing past the sun using the shadow cast by the LNA/feed point as a sight. You can use a diode detector and a meter (**figure 24**) tied to the output of your 70 MHz IF strip as an effective indicator and calling it perhaps the world's most expensive 'amplified crystal set' or at least one of the

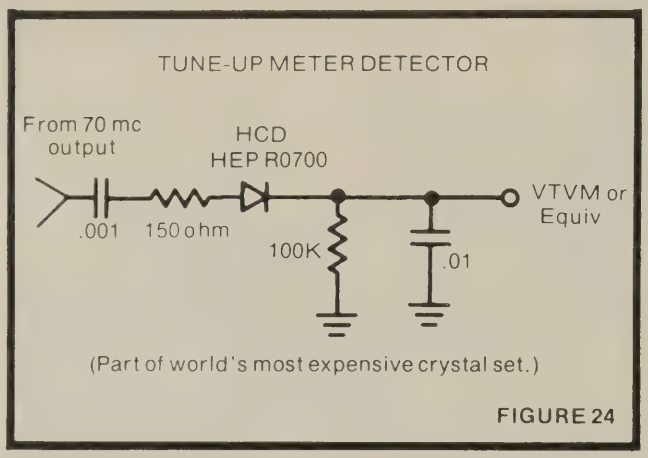


FIGURE 24

world's cheapest solar radio telescopes! Take your pick. The key idea here is to see some kind of change in the noise level because of the sun. The more the better.

THIS NONSENSE HAS GOT TO STOP!

With your equipment thoroughly checked, you can return to the antenna pointing angles. Recheck your calculations for the location of the bird. Crazy as it sounds you can get your own coordinates wrong and thereby cause your answers to be screwy. **Check the obvious.** Recalculate the position of the bird. Double check yourself by using the satellite pointing charts. An error of more than a few degrees should be suspect.

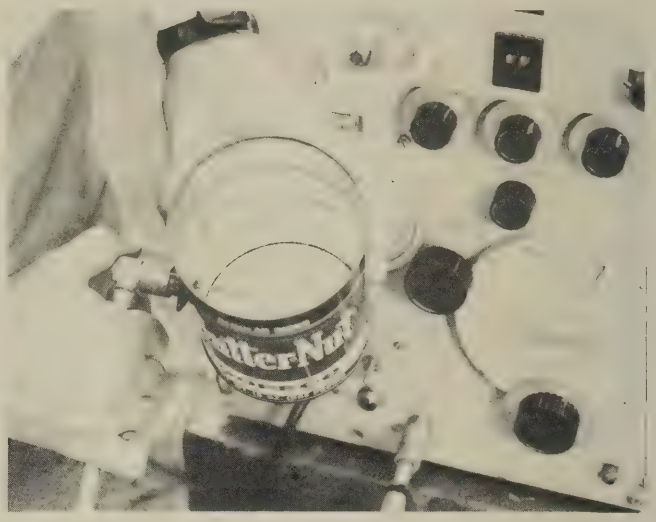
Next study your antenna. Is the LNA **really at** the focal point? An error of an inch or more can mean zero signal into your receiver despite the fact the dish is 'right on' the bird. Either check with the manufacturer or **calculate the focal point** from this simple formula...

$$\text{focal point} = \frac{(\text{diameter})2}{16 \times \text{depth}}$$

Next recheck your elevation inclinometer. Is it resting on a surface that **really is 90 degrees** or tangent to the look angle of the dish? You can check it to within a degree or two by pointing your dish at the sun using the shadow method we described before and then seeing if the inclinometer agrees with the sun elevation angle for your location on this date from the **STT Sun Shot Charts**.

Lastly, recheck your azimuth angle. If you use the sun shooter method, then double check yourself with a compass. Just stand some distance away from the antenna with the compass oriented for true north (use the Generalized Magnetic Variation chart in **Appendix B**) and eye-ball the azimuth angle from you to the center line of the dish.

If you've checked your equipment and aligned your dish and still don't have a signal, it's a good idea to shoot for another satellite because you will more often than not discover your error while going through the routine again. The secret to antenna pointing is to reduce the number of variables. When you arrive at simple azimuth and elevation angles as the only



WHILE BUTTER-NUT can works very well, who knows the output you might get from a Folger's or Maxwell House can!!!

possible variables left and you know for sure you've aimed your antenna right, then and only then can you say that the satellite is either dead or that somebody must have shot it down!

GETTING THE TIP OF THE PEAK

Once you've had that magic moment when your first picture climbs out of the sparklies you may almost immediately want to improve it. Rocking the antenna back and forth or up and down while looking at the picture works rather well. It works even better if you tune the receiver to **the weakest transponder** (the one with the **most** sparklies) and make your antenna fine adjustments.

An even better method for purists or those with marginal size antennas is to get a meter on the receiver. A simple method to use if you don't have a meter is to connect a shortwave radio that has an 'S' meter on it to the video output of your receiver and tune the radio to a data carrier on one of the many data transponders (tune 0 kHz to 4 MHz). Some receivers have filters ahead of the video output to effectively screen out the sound carriers above 5.5 MHz. It is not too difficult to simply open up the receiver with the diagram in hand and tap-into the circuit just ahead of the video lowpass filter. In fact a new connector installed on the back of your receiver and a line running from it to this tap-into point is a worthy addition so that you can do some FM music or data subcarrier hunting at a later time.

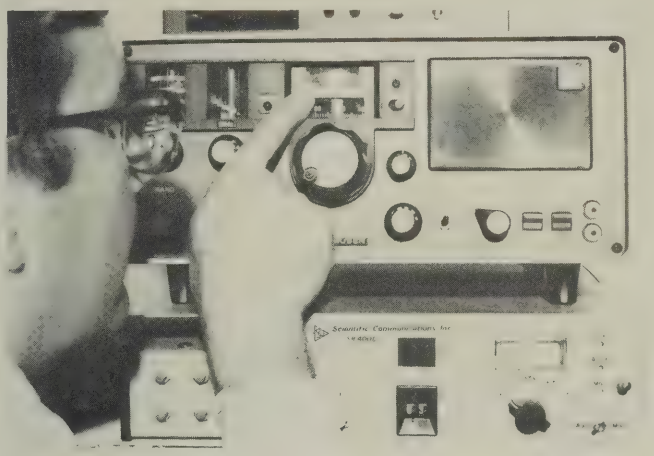
Okay, you've connected the radio and discovered you can almost understand FM sound on an AM receiver if you tune it right. **Instead**, tune for an **unmodulated carrier** rather than FM (there are hundreds between 500 kHz and 3 to 4 MHz on non-video transponders). Now look at the 'S' meter on the radio. That's your indicator. If it's 'pegged' at the top, you must turn down the shortwave receiver RF gain or install a resistive pad to cut the signal into the receiver to the point that you get a convenient reading. Sometimes when Edsel Murphy is not around you can discover that the nifty video carrier lowpass filter the manufacturer installed is just enough pad to attenuate the signal and you simply connect the receiver to the video output!

Now it is a simple matter to rock the antenna and watch the 'S' meter as an indicator. If you don't have a shortwave receiver but still want a meter, then build the super simple crystal set in figure 24 and tie it to the 70 MHz IF output. If you tie the crystal set to 741 IC opamp wired as a DC amp, you can run a line out to your antenna as an outboard 'S' meter and see first hand what happens when you change position.

BUILDING THE MOTORIZED MOUNT

A lazy Sunday of satellite hopping has either got to be a symbol of weirdness in the 80's or the absolute proof that

you've got what it takes to reach for and attain the benefits from what many think is a wild odyssey. Just imagine yourself with more than 68 channels at your fingertips. Push a button and your antenna moves from satellite to satellite, as though it were hopping from universe to universe. 68 channels and



A SHORTWAVE RECEIVER makes a dandy tuning meter. The receiver allows tuning in transponder carriers and monitoring them with the 'S' meter long before they are strong enough to register on TVRO receiver meter [below].

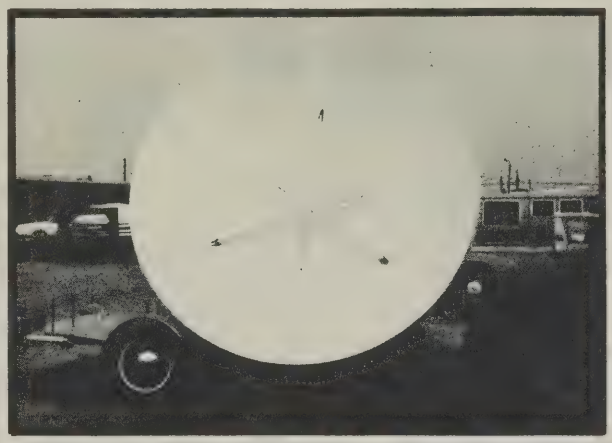
growing! And that's just the pictures. By now you know that there is more than just pictures up there. Wait till you hear the stereo music! And how about tying into that 'great database in the sky'? But we digress. So let's swing back on track and figure a cheap way to realize that lazy Sunday of satellite hopping.

Hanging a motor or two on a mount is really a custom job, but we can still suggest a few techniques that may steer you (no pun) in the right direction to quick, success. Keep in mind now that you don't have to know how an LNA works or any other technical stuff to motorize your mount. It's about as easy as installing an electrical socket if you can get a strong enough motor and some sturdy hardware to mount it. Levers, gears and chain drive connection arrangements are a piece of cake once you know how they work. We'll touch on the details as we go.

If you've installed a polar mount and only intend to reach a few satellites, then you may only need a single motor which you would mount on the single turning axis. You may choose to use a manual 'trailer jack' to adjust the declination in as much as you may not need to reach all the satellites in view at a time. On the other hand, two motors will give you worthwhile unlimited control. The AZ/EL mount will require two motors. Believe it or not, installing two motors is not twice as hard as installing one as we shall soon see.

Before we get more into the hardware, this might be a good place to suggest a special case where you actually could use only **one motor** and hit every bird. First you build the 'Laundry Pole' mount and stick a motor on the base of the dish as seen in **figure 25**. The motor has a gear on it and enough electrical wire to let it run along a curved track around the base. The height of the track is adjustable so the elevation of each satellite can be precisely set. But the motor and the track do not necessarily have to be geared. You could use a wire or winch approach so the motor would pull the dish along the track. Of course the motor must be reversible so you can swing the antenna in either direction. Another variation would be to simply lock the bottom of the dish in the track with something as simple as a wheel from a child's wagon and then apply a chain drive motor to turn the entire base. This idea is pure speculation and needs some hard thinking before it can be made to work.

HIT THE ROAD!



Hit the road with the leader; H & R's STARVIEW System. Nearly 100 systems shipped since Miami's SPTS; our dealers and distributors are on the road TODAY demonstrating and selling private TVRO systems!

STARVIEW DEALER SPECIAL

Complete 10' trailer mounted transportable system with top-quality commercial equipment, including:

- 10 foot STARVIEW parabolic equipped with rotatable feedhorn system
- Avantek 120°K LNA
- Microdyne 24 channel Receiver
- 75' of hookup cable and connectors

With this sytem you can pull up to a demo site and be showing off pictures in 30 minutes time! **The price?** $7200!

SUPER LNA SALE!

H & R lowers the boom on LNA pricing. Here is the price break through you have been waiting for...brand new, superb high quality AVANTEK 120 degree Kelvin low noise amplifiers with 50 dB gain **and** DC power block for feeding operating voltage through the cable...only $795 from H & R! If you didn't make it to SPTS '80 San Jose to take advantage of this special low price, contact us directly. **PLUS** - H & R now has in stock the brand-new Robert Coleman model 3742 24 channel tuneable TVRO receiver with fantastic features never before found on a private terminal receiver. Don't buy a receiver until you learn all about this one!

HIT the road with the 'Hit-Of-The-Road'; a STARVIEW system from H&R. YES - a limited number of dealerships are still available!

HIT THE ROAD!

H & R Communications
STARVIEW SYSTEMS
Route 3, Box 103G
Pocahontas, Ark. 72455
(501-647-2001)

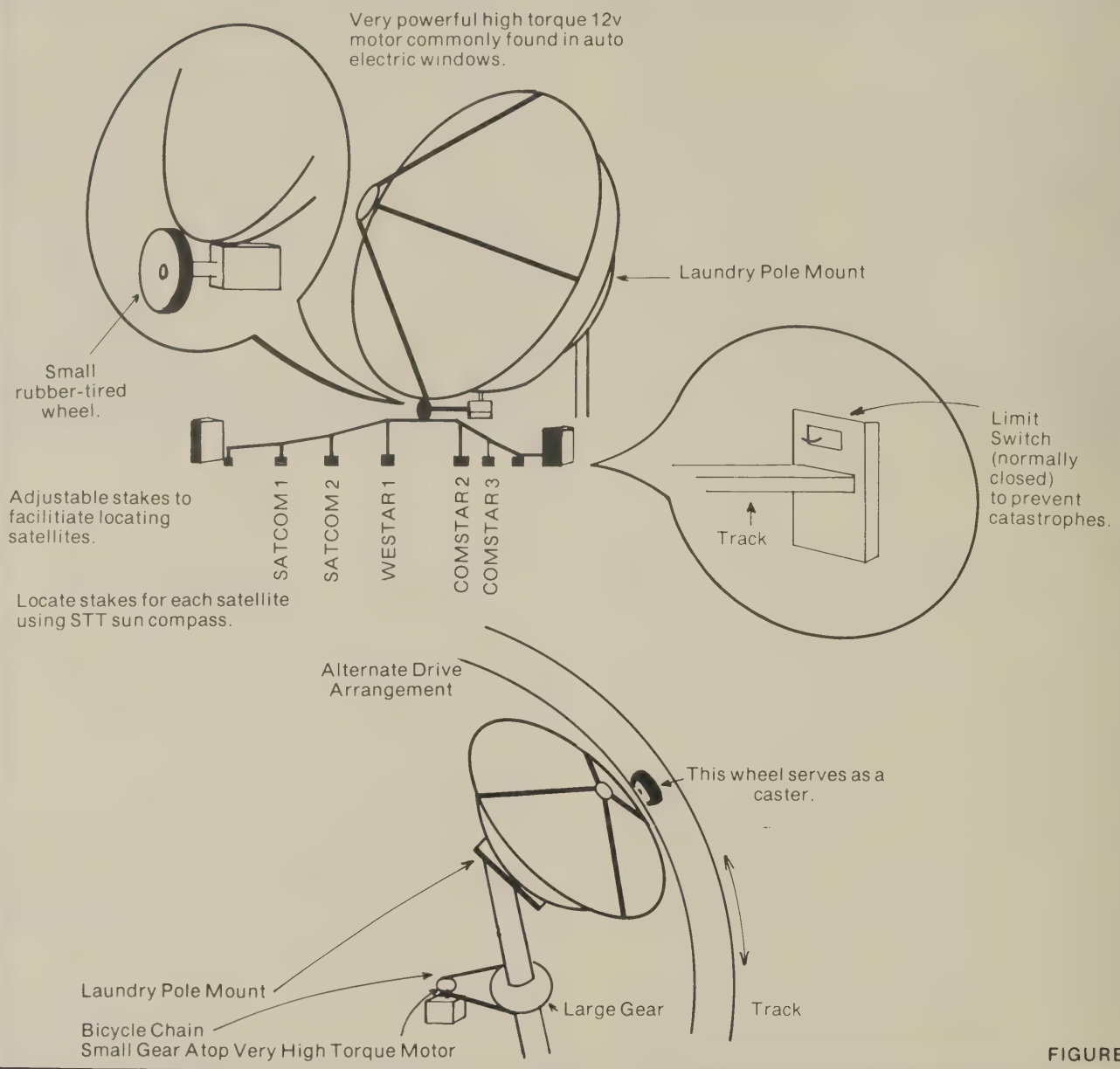


FIGURE 25

SLOW - TVRO System Delivery ?

ANXIOUS to get your earth station up and running? Tired of getting the run around on receiver and LNA delivery? Check with AVCOM!

AVCOM's field proven PSR-3 receiver is in full production. With remote tuning, dual video outputs, our exclusive Clamp-Sync and Scan-Tune, the PSR-3 is the finest TVRO receiver on the market. Combine this high-quality receiver with our in-house-stock of high quality 120°K (50 dB) LNAs and you have the best private terminal package available today. PLUS - **we deliver radios and LNAs**...not promises! YES - AVCOM always has room for one or two more qualified dealers and distributors.

AVCOM of Virginia, Inc. (804)320-4439
10139 Apache Road, Richmond, VA 23235

TVRO CABLE PACKAGES!

NOW available - special RG-217 low-loss cable assemblies with fittings installed and flexible pigtails; ready to plug in and go! 217 cable is the ideal TVRO cable, low loss yet flexible. Our special connectors are ideal for quick connect-disconnect too!

#1]80' 217 + 3 foot pigtail for LNA/rotation, all connectors. **$118** plus UPS.

#2]40' 217 'extender' with quick connect barrel connector. **$59** plus plus UPS.

PLUS - the Cadillac of LNAs from AMPLICA! **Each** LNA has factory check-out data sheet showing **exact** specs (some LNAs intended for consumer use are 'bulk rated' so you are not sure what you are getting). You can purchase our 217 cable assemblies for 50% this month with each (**single** quantity) AMPLICA LNA purchased. Quantity pricing on LNAs and 217 cable assemblies available - inquire!

AVCOM of Virginia, Inc. · (804/320-4439)
10139 Apache Rd., Richmond, VA 23235

By the way, Swan antenna builders might find this track idea is just the ticket for mounting your feedpoint on a movable mount so you too can change satellites using only one LNA!

Another style of motor is the linear actuator. What's that? It's only a motorized shaft that moves in and out of a pipe. Dandy for moving dishes and cheap. A surplus linear actuator (Model 387OR) with a throw of nearly 6 inches runs about $37.50 from **Airborne Sales, 8501 Steller Dr., Culver City, California.** Photos show you how a linear actuator can be applied to adjust azimuth as well as elevation in the fine tradition of Robert Coleman's inexpensive techniques.

SURPLUS linear actuator bolts right to the dish.

Suppose you need more of a throw than 6 inches? You can use simple levers you build from parts found at the hardware store or the junk yard. Looking at the diagram in **figure 27**, you can double the throw of any moving rod by connecting it to this simple lever arrangement, sometimes called a bell crank. The distance lever 'B' moves (your cheapy actuator) is doubled

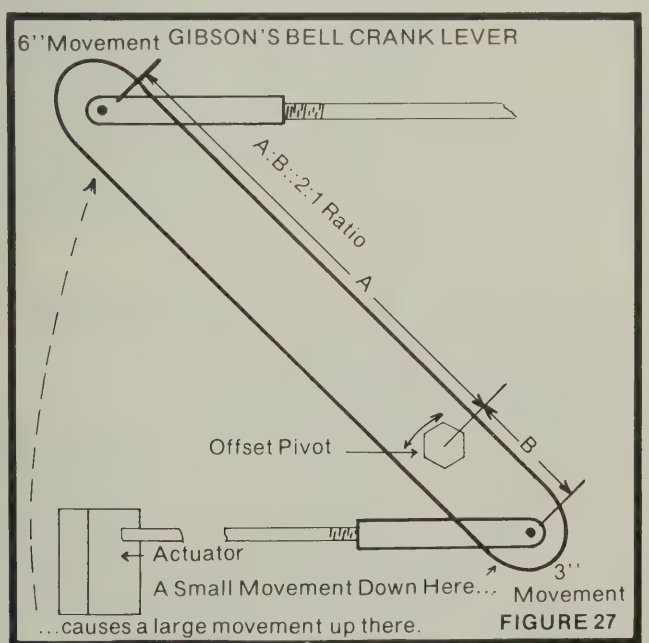


FIGURE 27

THEY CALL THIS BIRD MOLNIYA

A whole family of Russian satellites circling over North America and beaming live Russian television back into the USSR. Now because STT has researched the Molniya reception challenge and developed hardware modifications and software systems to produce high quality Russian television throughout North America, you can share in the excitement of this ultimate satellite TV fantasy!

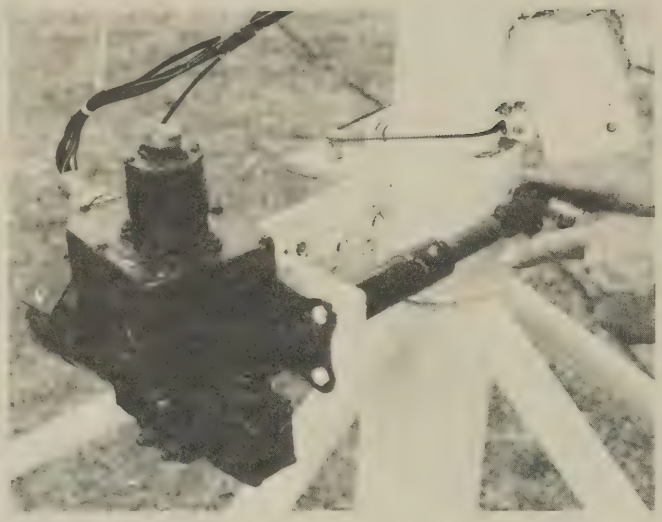
A very timely topic. Russian coverage of the 'Moscow Olympics' may well be the only 'live coverage' available in North America!

STT has rushed together a 2 hour color videotape in which Bob Cooper explains what the reception problems are, how you modify your equipment for Russian reception, how to find the Russian Molniya inclined orbit apogee in your northern sky.

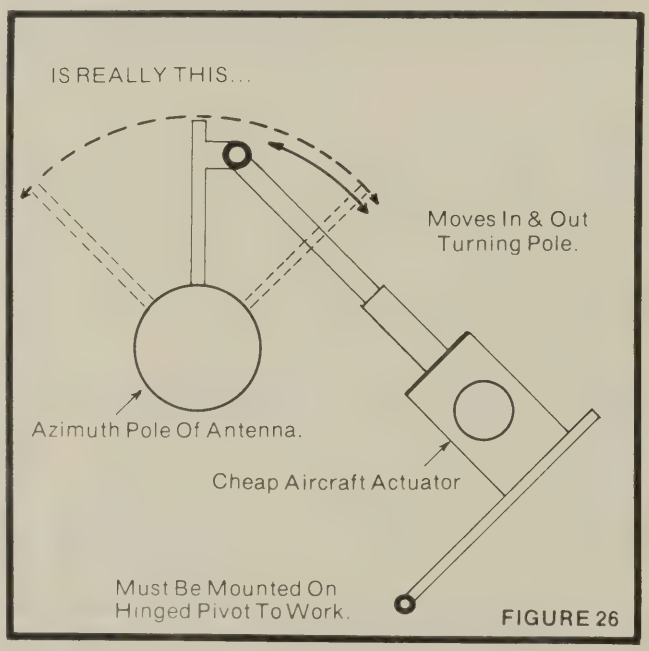
The two-hour 'They Call This Bird Molniya' STT **videotape** follows the construction of an 11 foot (ADM) antenna terminal, through the pain and agony of days of searching before the first Molniya was found, and ends up with the successful completion of the project and challenge. It tells the complete story, as it happened, including the excitement of the first actual reception.

STT videotape THS-1 is available for immediate shipment. Specify VHS or BETA format. Price $60 postage paid US and Canada; $65 (US funds) outside of US Canada.

STT P. O. Box G, Arcadia, OK 73007 405/396-2574



ACTUATOR BOLTS to a hinge mounted on the azimuth pole. Adjusting the distance from the center of the pole controls the number of degrees of rotation. NOTE: This.....

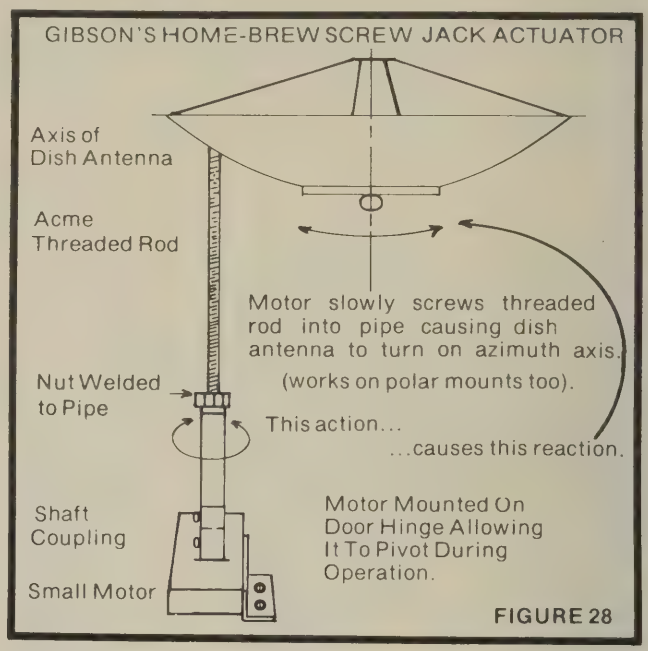

IS REALLY THIS...
Moves In & Out Turning Pole.
Azimuth Pole Of Antenna.
Cheap Aircraft Actuator
Must Be Mounted On Hinged Pivot To Work.
FIGURE 26

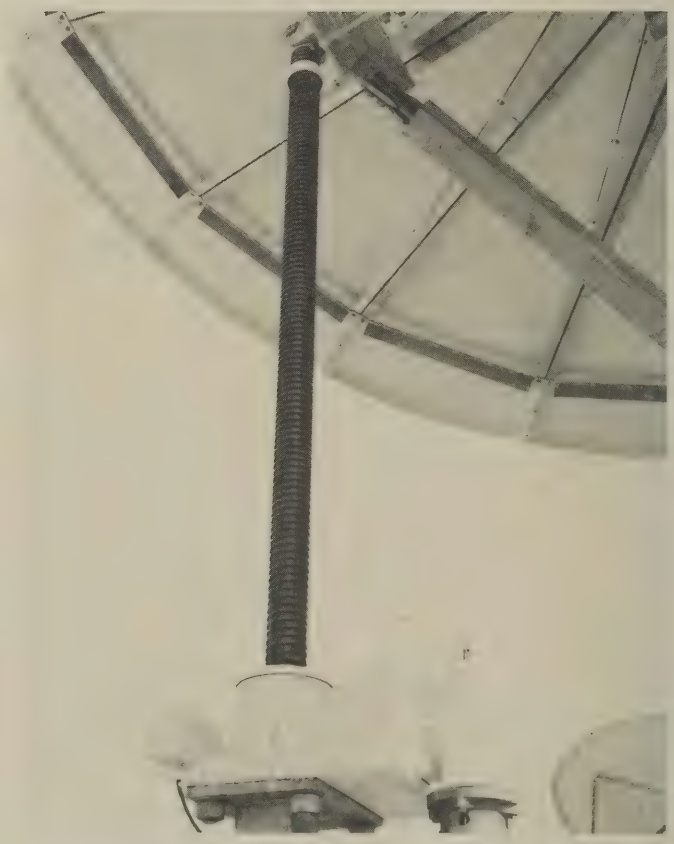
because lever 'A' (connected to your antenna) is twice as far from the turning point or fulcrum. Figuring the distances and dimensions is as easy as simple proportion arithmetic.

Another simple method of moving your antenna is to use a screw jack. You can build a unit like the one in **figure 28** by mounting a long pipe on the end of a motor that turns rather slowly (less than a few hundred RPM). A single nut is welded on the end of the pipe. Then a long threaded rod is screwed a few turns into the nut. The other end of the rod is connected to the dish. As the motor turns, so does the pipe which causes the threaded rod to be screwed deeper into the pipe and pulling your antenna around on it's axis.

You can find a good motor bargain from time to time in the catalog of **Herbach and Rademan Inc., 401 E. Erie Ave., Philadelphia, PA 19134.** or the catalog from **C & H Sales, 2176 E. Colorado Blvd., Pasadena, California 91107.**

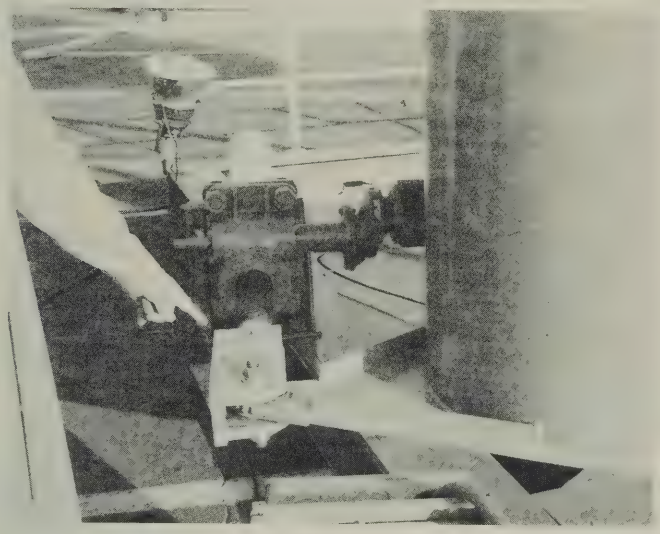
Both the motor and the rod must turn on their mounts. A large door hinge is a simple solution to this problem. Perhaps the key point here is to first understand what you want to do and then look around for what is available to do it. A trip to a junk yard to just browse is what we mean. Rather than recommend specific components, it is better for you to see what's handy and use it.


GIBSON'S HOME-BREW SCREW JACK ACTUATOR
Axis of Dish Antenna
Acme Threaded Rod
Motor slowly screws threaded rod into pipe causing dish antenna to turn on azimuth axis.
(works on polar mounts too).
Nut Welded to Pipe
This action...
...causes this reaction.
Shaft Coupling
Small Motor
Motor Mounted On Door Hinge Allowing It To Pivot During Operation.
FIGURE 28



SCREW JACK In use as a polar mount.

While a belt drive may seem attractive in as much as automobile fan belts are readily available, it's not a good idea because a stiff wind may cause your antenna to slip off the satellite. **We need solid rigidity**. Backlash or slop in the method you use to interface the motor could easily make you feel your antenna was back on that shakey saw horse! Doing it the easy way may not necessarily be the most satisfying later on. Still, one easy method to interface the motor is to use a simple bicycle chain drive. We must be careful here to watch for backlash or slop. **An adjustable mount** for the motor to remove slack in the chain is an absolute necessity.

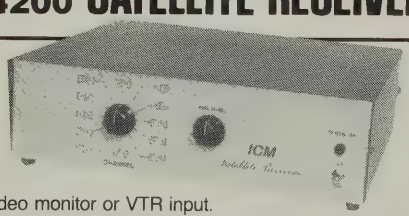


HORIZONTAL screw jack used for azimuth axis.

The secret, if any, to making sprockets and chains work for you is to know something about ratios. When a small gear makes a turn, it causes a larger connecting gear to make less than a turn. The possible arrangements available to you are endless and you can calculate what you may need from simple formulas found in any complete gear catalog. One popular gear company is Boston Gear and you can obtain their thick catalog by writing **Boston Gear, 14 Hayward St., Quincy, Mass. 02171.** They have branch offices in other major cities which would be only too happy to supply you with more info on gears, chains and sprockets than you can digest in a week!

Installing a chain drive arrangement is a piece of cake. Bicycle chain is easy to find and a small sprocket slipped onto the shaft of your motor is all you really need. In fact, you can do it all with a single sprocket! The idea here is that you wrap the chain around the turning axis of the antenna and secure it as seen in **figure 29**. The motor moves the chain and the antenna will still turn, but only one sprocket is needed. All you have to do to make this neat trick work is to use care in the positioning of your motor.

NEW ICM TV-4200 SATELLITE RECEIVER



Provides You With These Features For $1,995

- Output levels compatible with video monitor or VTR input.
- Dual Audio Outputs 6.2 and 6.8 MHz. • Built in LNA power supply
- Tunable Satellite channels 3.7-4.2 GHz.

International Crystal Mfg. Co., Inc.
10 N. Lee Oklahoma City, Ok. 73102 405/236-3741

The 8-BALL

12-FOOT SPHERICAL

SATELLITE TELEVISION ANTENNA KIT

LIST PRICE. $750.00

- *Rugged steel frame*
- *Aluminum screen reflector surface*
- *Durable redwood strips support reflector screen*
- *Easy to assemble*
- *Easy to align*
- *Receive signals from several satellites*
- *Very low cost*

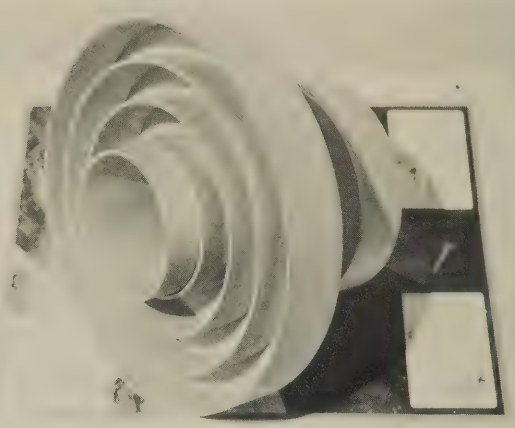
VIDIARK ELECTRONICS DEVELOPMENT CO.
P. O. Box 57
Salem, Arkansas 72576
Phone: 501-895-3167

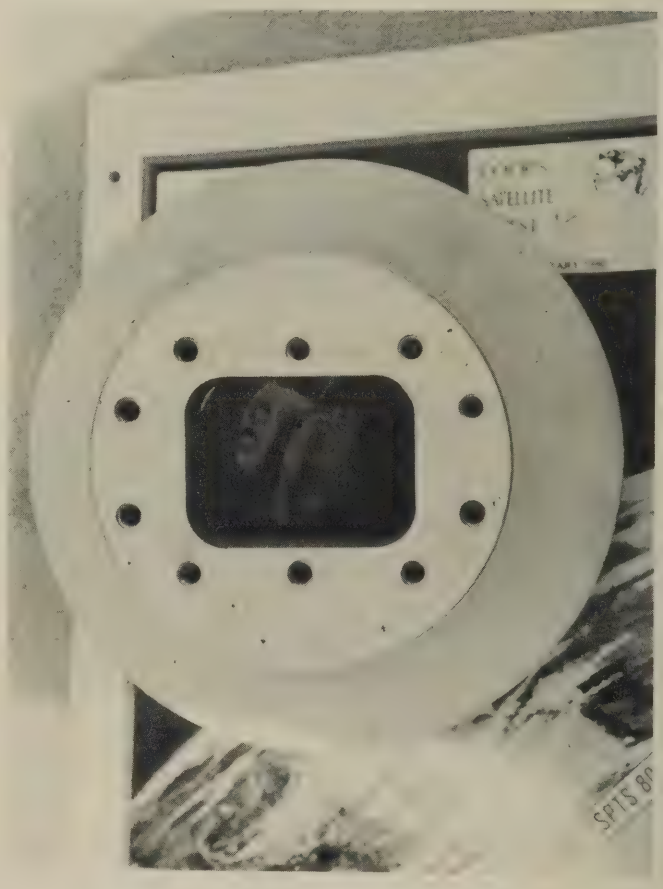
Alaska Microwave Labs
4335 E. 5TH STREET ANCHORAGE, ALASKA 99504
(907) 338-0340

TRANSISTORS	
MRF901 F T 4 5GHZ	$ 3 25
BFR90 FT5 0GHZ	$ 3 00
NEC 02137 F T 4 5GHZ	$ 3 25
HOT CARRIER DIODES	
MBD101 UHF – MICROWAVE	$ 1 50
ND4131 4GHZ NF – 5 75 DB	$13 25
4GHZ NF – 6 5 DB	$ 2 00
CHIP CAPACITORS	
10( )47( )100( )1000( ) PF	$ 60
RF – IF I.C. AMP	
MWA -110	
RF IF AMPLIFIER, C	
1 TO 400 MC 14 DB GAIN TYP	
3 TERMINAL IN, OUT, & GROUND	$ 7 95
DUAL GATE MOSFET	
RCA 40673	$ 1 50
COAX CONNECTORS	
BNC CHASSIS MOUNT SQUARE FLANGE	$ 1 87
BNC PLUG FOR RG – 58	$ 1 87
SMA CHASSIS MOUNT SQUARE FLANGE	$ 5 90
SMA PLUG FOR RG – 58	$ 6 57
SMA PLUG FOR RG – 174	$ 6 57
TYPE N CHASSIS MOUNT SQUARE FLANGE	$ 3 20
TYPE N PLUG FOR RG – 9/RG – 8	$ 3 69
FEED-THRU CAPACITORS	
500 PF	$ 50
TEFLON CIRCUIT BOARD	
APPROX 3 5 x 5 0 x 010	$ 5 50
APPROX 3 5 x 5 0 x 0312	$ 6 50
CHIP RESISTORS	
50 OHM WATT	$ 1 50
PISTON TRIMMERS	
Trko 201-01M 5–3Pf( )1–8Pf( )	$ 2 50

OPEN AT 8PM EST CLOSED 8PM PST
ORDERS ARE POSTAGE PAID
COD–VISA–MASTERCHARGE
IF YOU DO NOT SEE WHAT YOU WANT ASK

EQUIPMENT REVIEW CHAPARRAL'S NEW DISH FEED





AN EXTRA 0.5 dB?

Since the dawn of TVRO terminals, man has been looking for ways to improve the efficiency of his antenna system. Most terminal antenna designers talk in vague terms about the 'efficiency of the reflector surface' which leads the non-professional listener to assume there is something magical about the surface itself which has a direct bearing on how much signal the antenna develops. Of course there is one antenna-factor that does contribute to the 'efficiency' of the antenna; the precision with which the surface contour matches the parabolic curve selected for the design. But if you assume, with reasonable accuracy, that most antennas meet or exceed the nominal + /- 1/8th inch tolerance over their surface areas, and such antennas still seem to perk along between 55 and 50% 'efficient', what other factor is involved in the antenna efficiency equation?

The answer of course is the feed antenna; that prime focus package that attaches typically directly to the LNA and into which energy intercepted by the reflector surface is 'funneled' to the LNA input probe.

When a designer says that a reflector surface has achieved "55% efficiency" he is really telling you that the **combination** of his reflector surface **plus** his chosen feed antenna is capturing, for the LNA, 55% of the satellite TV energy actually intercepted by the surface of the dish. In other words, an antenna that is 55% efficient is actually 45% inefficient! Or, 45% of the signal present on the reflector surface (however momentarily it is there) never finds its' way into the LNA probe and your receiver.

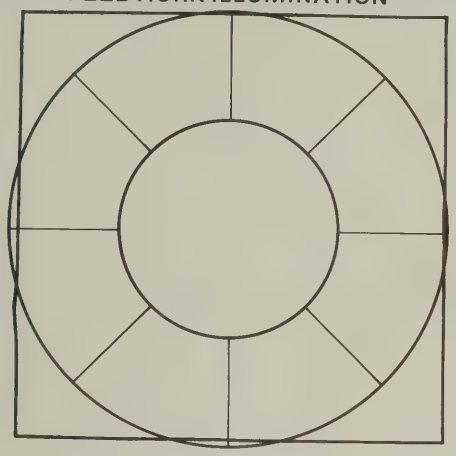
Taylor Howard has been saying for more than a year that "**...the next quantum leap in antenna technology will be an improvement in antenna system efficiency; perhaps to as much as 80% efficiency**". Teaming up with Bob Taggart of Chaparral Communications, Howard has set out to improve antenna efficiency by improving the design of the antenna feed system. This is a report on that feed innovation.

If you look closely at some of the commercial (as in CATV) feeds these days, you might notice they don't look like the now common-appearing 'horn antennas' which Howard describes in his Manual. In fact, they appear to be circular configurations similar in **some** respects to the Steve Birkill Scalar Horn launcher that sticks onto the front of the Birkill Hybrid Mode feed. Howard notes "**the empirical and mathematical literature on the scalar feed horn dates back to the early 60's with applications to many** (radio) **astronomy facilities and other high precision receiving installations**". In other words, nobody has invented anything here; rather there is simply an act of adapting something already known in top drawer professional fields to the low-cost world of backyard TVRO terminals. And in the process picking up some prescious parts of a dB of additional satellite carrier signal.

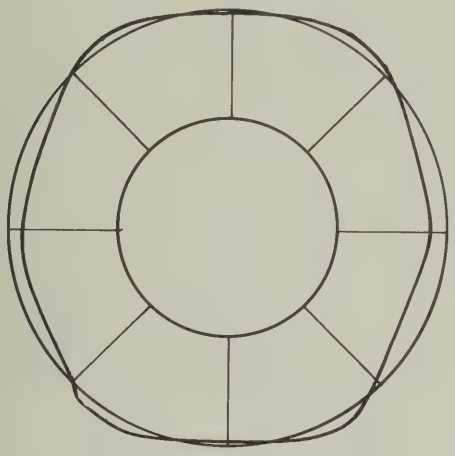
Readers are referenced to pages T11 and T12 for the April 1980 **CSD** where Tay Howard describes antenna range test measurements on his standard 'horn' antenna which is detailed in the 'Howard Terminal Manual'. Howard found the horn described in the manual to have an edge-of-dish illumination that varied from -11.4 dB (for a dish with an f/D of .5) to -23 dB (for a dish with an f/D of .25). In the common .4 f/D area the Howard horn had an edge of dish illumination of -14.4 dB.

There are two primary factors relating to feedhorn design which have a direct bearing on the performance of the overall antenna 'efficiency'. The first is the edge of dish illumination, which is actually only a point on a chart that starts off with the spread of the illumination at the center of the dish and then tapers, lower and lower in terms of feedhorn antenna pattern, towards all edges of the dish. Tay Howard notes "**ideally one would like to have a feed horn pattern that was square across the top and dropped to zero right at the edge of the dish**". One way to illustrate that is shown here. Receiver buffs will

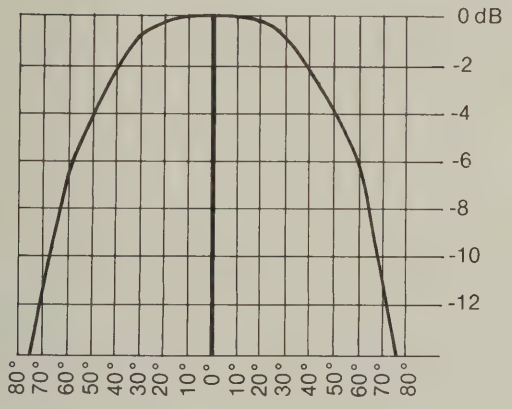
FEED HORN ILLUMINATION



"Idealized" Square Illumination



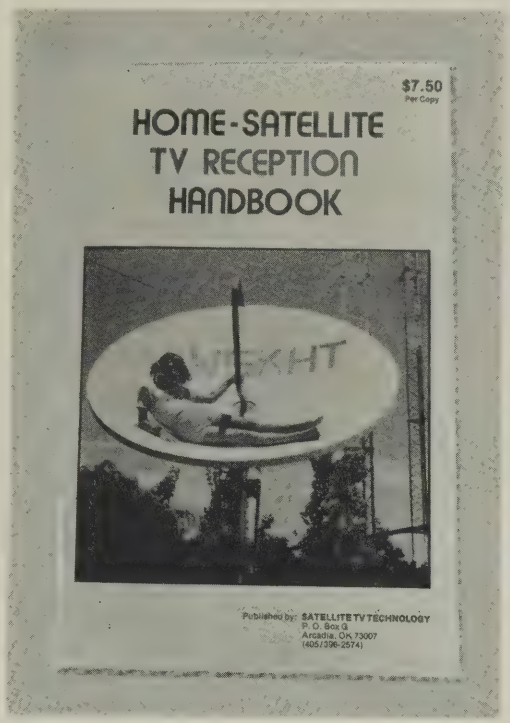
Near-Idealized 'Super-Feed'



Super-Feed Illumination as
A Function of Angle To Side

recognize the 'pattern' as an idealized IF bandpass curve representation or in essence a 'square wave'. Into this idealized pattern enters the real world where decades of parabolic testing has shown us that **maximum** (antenna system) **gain** occurs when the edges of the dish are illuminated at a level which is 10 dB 'down' (reference the illumination at the center of the dish, directly in front of the feed). But, that **minimum noise** (noise coming from the earth which sits behind

BRAND NEW for 1980!



The ONE book everyone cuts their teeth on; Bob Cooper's '**Home Satellite TV Reception Handbook**'. Now completely re-written and updated for 1980 including a new 16 page 'Sourcebook' section that lists hundreds of parts and equipment supplier sources! Anyone who was anyone in satellite TV, through mid-May of this year, is listed!

PLUS - completely new text on the latest equipment, latest transponder listings, international reception experiments and techniques. The complete primer that explains in lay terms what the satellite evolutionary revolution is all about, where it has been and where and how it is headed! If you are looking for a one stop source to help you explain how satellite TV (and audio services) work, what equipment is required and how much that equipment costs and where a person goes to get it, this 1980 version of the 'Home Satellite TV Reception Handbook' is for you. Price is $7.50 per copy in US, Canada and Mexico; $10 elsewhere via first class mail. Convenient order card in this issue of CSD.

STT P. O. Box G, Arcadia, OK 73007 405/396-2574

and all around the dish) occurs when the edges of the dish are illuminated far lower than -10 dB. Tay notes "**this is a matter for grim debate amongst the most precision minded users of parabolics, the radio astronomy crowd, and they typically reach a compromise where for their purposes the edge is illuminated down** (or -) **20 dB**"

In the case of the TVRO system where realistically one would shoot for a 'system noise temperature' in the 100 degree K(elvin) region, it can be shown on paper that the best C/N (carrier to noise ratio) occurs when the edges of the parabolic antenna are around 15 dB down (-).

When you have a more gradual taper in illumination, between the center of the dish or the so-called 'hot spot', and, the edges of the dish, you end up realizing more signal gain from the outer edges of the dish. BUT - in so doing you also have substantial earth-noise contribution picked up from the ground just beyond the edges of the dish (on all sides) and it is this noise, which then becomes **added to** the sky and equipment noise, which raises the overall noise 'level' (or system threshold).

The primary advantage to the standard horn described in 'The Howard Terminal Manual' is that the horn is cheap, not critical, and it works. It forgives slopping building techniques, up to a point.

But it is not optimized for maximum gain and least contribution of noise and this challenge sent Howard and Taggart back to the 20 year old texts originally created by the radio astronomy crowd. The result is the new feed antenna shown here. Howard calls it his E-MOD horn while Taggart likes to refer to the new device as the 'Super Feed'. Others might refer to the antenna feed as a 'Choke Plate Horn'. We suspect people will have their own versions in quick order and each will have a marketing name of its own!

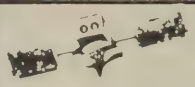
The 'Super Feed' has a pattern as shown here; it is down 10 dB at the 65 degree points (0 degrees is straight in front of the feed at the center of the dish) and down 12 dB at 70 degrees. At .3 f/D the Super Feed is down 16.5 dB and at .4 f/D it is down 10.3 dB. The useful f/D range for this feed is .3 to .5 and that catches just about all of the popular dish designs. The "efficiency" with this feed is close to 70%.

Now what does it do? Well, you will note that we have two separate devices here. One is a 'choke plate' (the fat, rectangular piece that ends up in a WR-229 flange) with a round tubular member attached. The choke plate is actually **a quarter wave transformer** designed to 'transform' or transition from the high efficiency round (tubular) feed member to the WR-229 flange. In other words, it gets you from 'round' to 'rectangular' without giving up a bunch of signal.

Attached to the very front of the tubular member is a scalar horn; that's the series of concentric circles hung on the front. Both the choke plate + tubular feed, and, the scalar horn are **aluminum castings** thanks to the clever hands of Bob Taggart. The whole system is capable of being mass produced and ultimately that affects the repetition from unit to unit as well as the ability to turn them out in volume.

The scalar horn is important; Tay Howard suggests that by having absolute concentric pattern on the front end of the feed the whole parabolic reflector surface is 'illuminated' (or 'seen') by the fed with identical precision. In the antenna world they talk of the 'E' (up and down or vertical) and 'H' (side to side or horizontal) planes of radiation or illumination. Since our parabolic reflector is round, it only has a top and bottom and left hand / right hand side because of **our** perspective; not because any part of the surface differs from any other part. However most feeds, in particular the common horn feed, try as they might to have exactly equal (i.e. the same) 'E' and 'H' plane illumination fields usually do not (it is probably safe to say 'never have' rather than usually do not have!). This means in the real world that while the left and right edges (for example) may be -10 dB the top and bottom edges may be -8 or 12 dB. Having both planes match is very important if you are going to get maximized gain out of the whole system. Guess what. The Super Feed has exactly matched 'E' and 'H' plane fields, within 0.1 dB. That's where part of its additional 'gain' comes from.

Again, this is not true with most horns since the E and H plane impedances are different (a function of the physical



SATELLITE TV
RECEPTION MADE EASIER!

For those wh are working with the Coleman or Howard TVR stem Manuals, here is a selection of PC boards, k ssembled units which will get you up and on much sooner!

The follo 's piggy-back to our LNA amplifier er boards to provide you with regulate the important low noise amplif

THIS PRODUCT NO LONGER AVAILABLE

Mod	Only Kit	Wired/Tested
MRR	$10.	$20.
BSAB	$10.	$20.
FDAB (FE	$20.	$30

To recover s air of systems designed to tuning for subcarriers. Wh ted, specify subcarrier freque nt for easy stacking switchin

Model	PC Boar	Tested
SAA-2	$3 00	

If you are fighting the ba IF system **with** a built-in dem annel 3 RF remodulator, here's you add audio, order one or more SAA boarc OWARD Manual required

Model	PC BOard Only	Kit	Wired/Tested
70HIF	$10.00	$150.00	$300.00

All boards are supplied with complete data for construction. AND - call or write us about our NEW TVRO receiver!

ROHNER MACHINE WORKS
John P. Rohner / 7th & Elm Streets
W. Liberty, Iowa 52776
(319-627-4212)

SUCCEED with OUR
DEAL for DEALERS

OUR **TVRO** SYSTEMS DEALERS
ARE FURNISHED . . .

+ COMPLETE SYSTEMS
+ SUPERB EQUIPMENT
+ REMOTE CONTROLLED
SATELLITE TRACKING
+ SALES PROGRAMS
+ TRAILER MOUNTED DEMO
+ TECHNICAL ASSISTANCE
+ INSTALLATION INSTRUCTIONS
+ FINANCIAL ASSISTANCE

WE HAVE MANY YEARS OF EXPERIENCE IN ELECTRONICS AND TELEVISION SALE AND SERVICE WHICH ENABLED US TO DEVELOP A VERY SUCCESSFUL PROGRAM FOR OUR DEALERS.

CALL US TODAY!

HOME SATELLITE TELEVISION SYSTEMS
DIV. RIECO TV SERVICE, INC.
6541 East 40th Tulsa, Ok. 74145
918-664-4466

configuration of the horn) and their respective focal points are therefore different.

Now what does all of this fine technology do for you?

We were fortunate enough to lay our hands on serial number one of this new feed. We wasted no time putting it to work. Tay Howard told us that with f/D of .4 we might expect to see an improvement in satellite carrier levels as great as 1 dB. We promptly put it on the 11 foot ADM antenna we have been utilizing for Molniya reception (see separate report this issue of **CSD**). The holes all lined up appropriately with the holes on our LNA and being purists we tightened up all 10 1/4 x 5/8 bolts. Now Molniya is supposed to be right-hand-circular polarized but **we have found** that at various points in its orbit our linear feed needs to be tweeked a bit to optimize the signal. In theory we shouldn't find the Molniya signal varying at all, as a function of polarization matching, since our linear feed probe will only be seeing 50% of the wavefront at a time anyhow. We found that there is apparently an 'optical-elliptical' format to the signal as it rounds the apogee point and we could pick up an extra dB or so by carefully matching polarization. With the 'Super Feed' in place we checked back and forth against a standard .4 f/D feedhorn. Guess what. Sure enough, we were averaging around 1 dB **better** even on Molniya with the Super Feed.

Next we tried the Super Feed on the big twenty foot monster antenna we have had up for nearly three years now. The f/D on this antenna is also in the .4 region. We moved off to ANIK since it is closer to sparklies than the US satellites. We were very surprised to find the additional signal gain, on our 20 foot monster dish, was **above** 1 dB; even approaching the 1.5 dB point. And here for nearly three years we thought we had been properly illuminating the 20 footer!

(We've had, through the years, a number of very qualified people out here for visits and one Scientific Atlantic super engineer even hauled a station wagon filled with test gear out to run a 'proof' on our system for us. Nobody had ever been able to measure our 20 foot system at the C/N level the computer runs said we **should** have. We were always low by nearly 1 dB. **I guess we just found it!**]

What does .5 to 1.0 dB buy for you? Well, let's see what options you might have if you have built a system that needs just that much more signal to get out of the sparklies.

1) **LNA** - let's say you have a 120 degree Kelvin LNA. You can't make the antenna reflector any larger, and the only way to get the carrier up is to get the noise down. If you need .5 dB more C to N, you would have to lower the N portion of the equation from 120 degrees to 78 degrees or so. If you have priced LNAs recently you know that a 120 will set you back $800 or so but a 78 will set you back closer to $2500. That's a tough way to pick up 0.5 dB C/N!
2) **Antenna** - you say you need 1.0 dB more C and you don't mind putting some more antenna up in the air? Well, if you have a ten footer to start with you will have to go to around 11.4 feet diameter (from 10) to get that 1 dB. You might put extender panels on to get that much.

When you boil it all down, the improvement in reflector 'efficiency' with an improved feed (in this case the 'Super Feed' by Chaparral) is probably the **least expensive system improvement you can add** to your system. Chaparral (P. O. Box 832, Lo Altos, CA 94022; 415-941-1555) has a list price in the $135 region for this new feed. They ought to sell a ton of them and we wouldn't be surprised to see this feed become the 'standard' for home terminals in record time. We are just glad we got ours early...we hate waiting in long lines!

If you are new to the TVRO arena and are having some difficulty digesting all of this new technology all at once, you have possibly avoided any deep study of the subject of 'extra audio subcarriers' thinking that they can wait until you have the basic video section up and running. It may have escaped you that if you are going to have any audio to go with the much desired video signals sooner than later you are going to have to approach the sub-carrier detector problem.

Actually you have a number of audio demodulator options

EQUIPMENT REVIEW

ROHNER

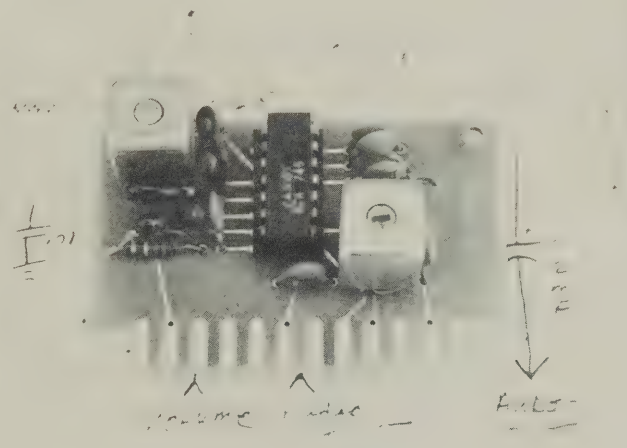
A DEMOD

THIS PRODUCT NO LONGER AVAILABLE

available. anual covers use of the CA306 hat accepts FM subcarrier inpu usands have built up this appro overed an RCA standard modu d for the same purpose; more d in the December **CSD** (page T . J **CSD** (page T15).

Then there is a kit available which allows you to build up, for approximately the price of the RCA PM-200 module, a small audio sub-carrier detector. The supplier (Rohner Machine Works, 7th and Elm Streets, W. Liberty, Iowa 52766) sent us down one of these units to check out.

The model SAA (Satellite Audio amp-Demodulator) kit sells as a kit for $15.00; or wired and tested for $25.00. The unit is a 3065 device with a pair of tuned circuits to allow you to adjust (as in tune-up) the system to the particular audio sub-carrier you want picked off of the transponder.



Most TVRO receivers provide separate video (baseband) and audio (baseband) outputs. This is done by first allowing the video demodulator to recover all of the modulation information in the (typically 70 MHz) IF and then feeding everything in the demodulator **output** above say 4.5 MHz or so to a **separate** audio demodulator. The video information is at baseband once it comes out of the basic receiver demodulator while the audio, sent along as it were as a separate sub-carrier between 5.5 and 7.5 MHz, kind of thinks it is 'higher frequency' (video) information until you tell it that is not what it is! In short, baseband video (after PLL demodulation or discriminator demodulation) still has the audio (sub-carrier) tagging along as an 'RF' signal; it is not yet true baseband.

The aural sub-carrier demodulator is nothing more than a very simple integrated circuit FM receiver; it will accept any FM signal in the design frequency range (typically between 5.5

and 7.5 MHz) and detect or demodulate the (FM) audio.

The 3065 is an ideal device for this detection system since it has virtually everthing inside of the 14 lead IC that is required to detect and process FM audio. All that is really 'missing' is a handful of small resistors and capacitors to feed voltage into the device and audio out, and, two tuned circuits.

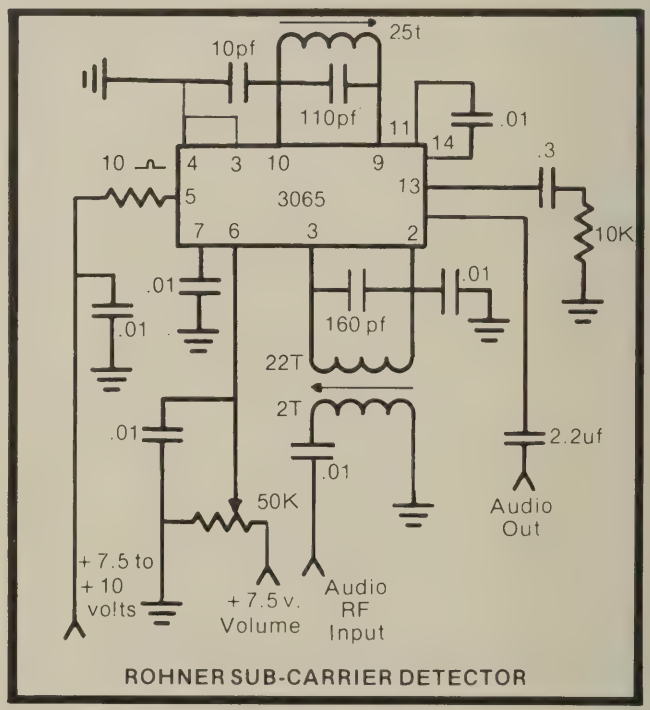
Now without the tuned circuits wired into the 3065 internal parts, the 3065 'FM receiver' doesn't know which of the FM signals present to 'detect'. The tuned circuits are actually nothing more than 'filters' which when tuned allow you to select what portion of the radio spectrum between 5.5 and 7.5 MHz you wish to reach the guts of the 3065. Having 'filtered' out the noise and unwanted carriers with the tuned circuits, the 3065 has a 'clean shot' at the one carrier you wanted detected.

Rohner's SAA board combines the tuned circuits, the handful of resistors and capacitors required external to the 3065 into a single package. Our particular unit arrived wired and apparently tested although we think most people would opt to buy the kit and pocket the $10 difference. The trade-off is perhaps 1 hour of your time to wire the unit up; 40 minutes trying to figure out what to do where and 20 minutes actual wire-up time.

John Rohner is something of a computer-freak and he sends you your written instructions on a computer printout. There are 14 steps in all. Most are clear and concise if not beautiful. Step 4 has you taking the lid off of the two tuned circuit ('IF') cans and winding some wire around the forms. The coil winding instructions are fine for a 'pro' but we suspect a novice would not be able to tell from the instructions what to wind over what. John could clear this up we think.

Step number 10 tells you about hooking up the completed board; including where to apply voltage to adjust the volume on the output. This one, like step 4, will give no pro a problem but it is totally confusing to a novice. How much voltage to apply, and what value volume control pot to use, is missing.

The prior CSD literature on the subject of sub-carrier modifications of the PM-200 gave elaborate steps for tuning up the device. Tune up consists of tweeking the two tuned circuits so that you start to hear audio coming out of the speaker. Most of the instructions told you to round up a signal generator and a scope and to adjust the two slug-tuned forms for maximum signal through the device from the signal generator. Since signal generators and scopes are not always available we decided to see if we could simply brute force the beast into audio.



ROHNER SUB-CARRIER DETECTOR

We went into our receiver and found around + 2 dBm of baseband garbage (signal). That we connected to the input. To the output we connected a two-watt audio amplifier we found at Radio Shack. Then we tuned up transponder 21 which has sub-carriers operating at 5.8, 6.8 and 7.4 MHz and we started playing with the two slugs. These powered-iron-like slugs are delicate by the way; you need a very small screwdriver or better yet a tough plastic tuning tool to slip into the slightly rectangular slot on the top of the slug to make them turn. Don't use much pressure, don't turn too fast, because after repeated tuning and turning you'll wear the slug material off the grooves and they won't turn anymore!

It took about 30 seconds to find sound. Not good sound but a start. In another minute we had the second slug tuned for much better sound and then in a final minute we had both slugs adjusted by ear for as good sounding audio as we had expected to have. Our bottom line is you don't need to spend several

LOW NOISE AMPLIFIERS
MAJOR BRANDS-Low Prices-Write!

3.7 – GHz DOWNCONVERTER

GHz in, 70 MHz out
ne control tuning
ion - stable
sted $895

Feed Rotation
ish
aid

THIS PRODUCT NO LONGER AVAILABLE

•Teflon PC Board ... x9" x4" $14.00

•Chip capacitor kit 12 e... 470 pf ... on) $18.00

•SMA and Type N connectors

• 141 Semi-rigid coax $3.45 per foot

•... tube for Birkill feed $12.00

SATELLITE INNOVATIONS
P. O. Box 5673, Winston Salem, NC 27103

Add $2.00 shipping and handling

hours looking for a signal generator that tunes 5.5 to 7.5 MHz and a scope to tune these up; just use your ear!

Now the audio that comes out of the SAA board is not really great hi-fi audio. The audio that goes **to** the bird on the sub-carriers is **pre-emphasized** in an effort to improve the overall audio signal to noise ratio. To get the audio spectrum back into its proper spectral-bandwidth relationship you need to **de-emphasize** the recovered audio. Tay Howard places a .01 capacitor from pin 7 to ground for this purpose; Rohner does also. Clyde Washburn in his receiver spends a few more cents and another 30 minutes of builder time insuring that the de-emphasis network is capable of reproducing the true high fidelity audio that the satellite is capable of delivering. Someone with more time than we could probably study the Washburn Manual and develop a better grade audio de-emphasis system for the 3065 device. Mind you the audio is not bad; it simply could be better.

Rohner's SAA boards are designed to 'stack'; that is you can put several together (as Rohner does in his new TVRO receiver) to switch between the common audio sub-carriers between 5.5 and 7.5 MHz.

Other than the suggestions made here, we rate the Rohner SAA as a 'good value' and can recommend it to **CSD** readers. And this aside; we were concerned that there might not be enough 'range' in the two circuits to tune up to the Russian Molniya audio sub-carrier operating on 7.5 MHz. As those who have heard the Russian audio on our '**They Call This Bird Molniya**' videotape will attest, indeed it does make it that high 'in the band' although here is a perfect example of not being able to adequately de-emphasize the audio since we do not at the moment know what the Russian's use for pre-emphasis.

TECHNICAL NEWS NOTES

CABLE people switching or adding satellite programming via WESTAR 3 are quick to point out that WESTAR's stronger-than-FI signal will be a boon to smaller terminals. Many cable systems that will add terminals for '3' reportedly are considering ten foot dishes since WESTAR footprint is in 36 dBw region in central USA.

ARIANE L02 launch from Guyana aborted only 20 miles downrange from launch site. Loss is considered setback to ESA program to be independent of NASA. On board and presumed lost was OSCAR 9 amateur satellite package.

ROBERT COLEMAN's silence ends at this month's SPTS San Jose when he appears in STARVIEW Systems booth with new double-conversion receiver he will be manufacturing and marketing exclusively through STARVIEW. Unit has $2,000 range **list** price (model number 3742), remote (by wire) channel change, AFC (on/off), polarity switching, dual audio recovery (one factory set on 6.8, second is varactor tuned over full 5.5 to 7.5 MHz range by user), scan tune (starts at bottom and goes through transponders holding on anything it finds for about 5 seconds), a vertical-horizontal polarization switching system tied to receiver controls, 20 MHz IF. First versions at SPTS use AVANTEK VTO devices but later versions will use frequency synthesizer.

NCTA cable TV convention managed to have 16 satellite TVRO dishes on display or operating. If you attend SPTS 80 San Jose we suggest you count the number of 'low-cost' TVRO antennas on site. NCTA with 8,000 attending is a piker!

WHILE cable TV programmers seem split on scrambling question and perhaps even leaning away from scrambling, OAK is now advertising Satellite Scrambling System with $9,900 uplink scrambler and $2,900 receive site scrambler. Delivery? Early 1981 at earliest.

PARAFRAME's Jim Vines recently awarded US Patent for his parabolic dish construction technique; PARAFRAME now producing antennas near Good Hope, WV.

FIRST South America domestic satellite system using dedicated bird(s) may be Brazil, Argentina and Chile. Talks are leading towards establishing non-DBS service utilizing 34 dBw birds to be shared primarily between Brazil and Argentina with Chile buying on agreement extra transponder space.

SPACE SHUTTLE continues to slip and now NASA itself is suggesting its own estimates are probably overly optimistic. First manned orbital flight now scheduled for March of 1981.

FCC sounds optimistic about ability to find orbit space for **all** of those firms who had filed by May 1st cut-off but insiders at Commission note "**...if we can pull this off several of the applicants will not get the spots they requested**". First serious study and announcements not until September at earliest.

FUJITSU reportedly has allowed a handful of GaAs-FET 'IC type' devices into US for early design purposes for what may eventually become semi-ICed TVRO front end for 4 GHz C band. Devices combine VCO and mixer into single 'chip', require around 25 dB of gain ahead of them at 4 GHz for 120 degree receiver noise figure, will delivery output in any UHF range (i.e. 500 to 1000 MHz) user wants and target price for 1981 delivery is in $35 region!

US customers of INTELSAT can now get signals **directly from** international birds, no longer must satisfy FCC legal requirement that had them going through one of the US domestic carriers (RCA, WU, COMSTAR). Primary early beneficiary likely to be Ted Turner's CNN which has 11 meter terminal installed in Atlanta to pick off INTELSAT feeds.

ADOPTION of new Chaparral 'Super Feed' by original antenna equipment manufacturers as 'standard feed' likely to be nearly 100% of all antenna suppliers by San Jose SPTS. ADM, Satellite Television Systems, Starview and Paraframe evaluated the feed early, most indicating they liked it (see report this issue, Technical section). Microwave General Corporation meanwhile introduces three new feeds of its own at SPTS San Jose.

GENUINE HOWARD TERMINAL PC CARDS

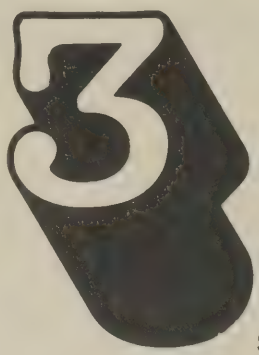
Bob Coleman and Tay Howard are now producing six PC cards which make duplication of the Howard Terminal (latest version) a snap!

(A)Dual Conversion (4 GHz to 70 MHz) - $25.00
(B)70 MHz IF and Filter - $25.00
(C)Howard Demodulator - $40.00
(D)Dual (2 channel) Audio - $25.00
(E)Single Channel Audio - $15.00
(F)AFC and Metering - $15.00

These field proven and tested high quality boards are available as a five-board-package for $99 package price (you receive A,B,C,E and F above). Included is complete documentation for construction and a list of parts stocking distributors.

Order from: Robert M. Coleman, Rte. 3, Box 58-A
Travelers Rest, S.C. 29690

NOTICE to CSD subscribers: We **MUST** have the address label from your **CSD** mailing envelope with any request for address change; without label, your request will be delayed subtantially. Contemplating moving? Take this month's label and stash it away in a safe place!



NEW MANUALS FROM STT

(1)

Stephen Gibson's 'THE SATELLITE NAVIGATOR' is possibly the finest manual ever assembled by STT. Author Gibson covers every aspect of satellite 'navigating' (i.e. the art of finding satellites from your spot on the ground) and **he builds into this latest STT manual** cleverly designed navigational aids including an inclinometer (to measure your antenna's elevation) and a Sun Compass (to help you accurately measure azimuth). Gibson goes from the very elementary mount (a laundry pole in the yard) to super sophisticated mounting systems including a complete electronic interface box to tie your motor driven dish antenna to your TRS-80 (or similar micro) computer for full 'autodish' operation. Filled with practical tips on mount design and construction, step by step instructions on 'boresighting' the satellites, computer programs galore and the word of an experienced man on trouble shooting your system. Bob Cooper says "I read this manual six times during the course of preparing it for publication; each time I found myself discovering new ways to modify my own antenna mounts. This manual may well be a curse to my spare time; after reading it I have dozens of new projects to get started on!" The price is $30 postage paid US, Canada, Mexico; $35 elsewhere. A must for any serious satellite terminal operator. See order card to right.

(2)

Nelson Ethier's 'PARABOLIC TVRO ANTENNA MANUAL' will probably make several people independently wealthy. Here is the full 'game plan' for starting up a business building 10, 12 (or larger) foot TVRO antennas, mounts and feeds. Nelson's manual will make everyone an instant expert on the nitty-gritty world of building superb, high-quality parabolic reflector surfaces. He uses a combination of fiberglass and metal to produce a professional looking, high-performance dish that virtually **anyone can duplicate** from his step-by-step plans for between $300 and $500. PLUS - he suggests that after you build a mold for your first dish that you rent the mold around to others in your area so that you in effect become a supplier in the antenna field! Nelson is a bug for having precision workmanship and he gives you complete instructions on achieving a 1/8th inch surface tolerance over the 12 foot surface. Formulas and instructions included will assist anyone who wants to build larger-than-12 foot antennas to do so. What a neat way to turn your garage into a factory! The price is $30 postpaid in US, Canada and Mexico; $35 elsewhere. Don't start building your own antenna until you study this manual carefully!

(3)

Bob Cooper's 'SATELLITE OPERATIONS MANUAL' probably should be kept under lock and key in your TVRO viewing room. Coop has been assembling data from people who like to mess around tuning in 'the hidden stuff' on satellite transponders for years and now he gives away all of the trade secrets. Like finding network executive intercom audio channels, news-wire teletype channels, the Moscow-Washington 'Hot Line' RTTY and voice link back-up on Molniya and more mundane stuff like several dozen Holiday Inn 'Holidex' ® 800-number reservation lines on satellite. He tells you where to tune in four different Anchorage, Alaska AM radio stations sent out via satellite, Alaskan flight weather, and hundreds more. PLUS - this manual is more than a clandestine sourcebook for the secret services. It includes dozens of step-by-step instructions for LNA and feed system operation, sub-carrier units, and a whole chapter on the latest Russian Molniya reception techniques. It even has a section detailing re-broadcast of satellite received channels via low-cost VHF television translators (including a look at such an installation). A section on trouble shooting your system; more than 20 chapter-sections in all! If you are into satellite reception, you need this new Coop manual. If you are thinking about getting into satellites, one look at this book and you won't rest comfortably until you too have your terminal up and running! The price is $30 postpaid in US, Canada and Mexico; $35 elsewhere. See order card to right.

BRING HOME THE STARS

THIS PRODUCT NO LONGER AVAILABLE

PROFESSIONAL PIC
Our STAR Antennas fea
Marine aluminum and sta
antenna installation time (n
rotor cables and LNA cable
outperform larger size antenn
mount that eliminates declinatio

ers start with professional antennas.
struction with high quality fiberglass,
flame coated. **Dealers** love our fast
ur environment LNA shield covering
efficiency parabolic surfaces that
e exclusive VARIDEC single axis
polar mounts!

SELECT the appropriate STAR Antenna to bring home the 'Stars' to your area. **Model SRO 4F** is 4 meter 'unit' construction with gain of 42 dBi. **Model SROS 4F** is the identical antenna in three piece segments for shipping; still 42 dBi! **Model SRO 3F** is 3 meter 'unit' construction with gain of 40 dBi. Delivery on all antennas, 15 working days from receipt of order!

STAR

STAR ANTENNA products and complete TVRO systems (featuring the best TVRO receivers and LNAs at very competitive prices!) are available from **Satellite Television Systems, Inc.**, P. O. Box 51837, Lafayette, LA 70505 (318-234-2495).
FOR the name of the nearest dealer to you, or an opportunity to become a dealer, contact **Star Antenna Manufacturing, Inc.**, P. O. Box 51902, Lafayette, LA 70505 (318-984-0992).

COOP'S COMMENT ON PROGRAMMING

COTTAGE INDUSTRY

I am not sure how your dictionary might define 'cottage industry'; my dictionary jumps from cottage cheese to cottage pudding without a mention of industry.

So I'll try to define it. If you decide to set up a business in your home (''cottage'') and you run and operate the business from your home, **that's cottage industry**. No big time staff, corporate offices or multi-media image. You just set out in the comfort and privacy of your own home to do 'your own thing' and hopefully you make a few bucks at it.

I identify with 'cottage industry' because that's what Susan and I do here at STT. Our home is also our place of business; we live six miles north of where the road stops, out here between Oklahoma oil wells (none belong to us) and herds of cattle (also, none belong to us). Our five acres is devoted to raising antennas, some fruits and vegetables, and two kids. The Arcadia post office is a 6.5 mile drive and we are Arcadia's largest post office customer. It's a one-man post office (the Postmaster also sweeps the floors) and when we fill up our meter with $3,000 in postage every couple of weeks you can see his eyes roll to tilt because he knows he'll get 3,000 or so large brown envelopes back to process in the next few weeks.

I think the home satellite TV industry is a perfect example of an area where you and hundreds like you could be getting yourself 'independent' of an 8-5 job and being dependent upon some big shots' whim whether you have a job or not.

In the brand new **Nelson Parabolic TVRO Antenna Manual** author Nelson Ethier makes the suggestion that if you build his 10 or 12 foot antenna, the mold you build to make the first dish can be used and re-used as often as you like. Nelson suggests that if you rented out your mold after building your own antenna, you could recover some or all or even more-than-all of your own antenna's cost through mold-rental-fees. Nelson further suggests building 10 and 12 foot antennas for a living would be an excellent 'cottage industry'. I think he's hit the nail squarely.

I've watched with interest and pain and even dismay the comings and goings of 'national' antenna manufacturers. I see lots of promise in some of the designs offered but I also see lots of problems. The biggest one is the shipping problem. A 12 or 13 foot is, I think, the ideal home-sized antenna; the perfect balance between big-enough for good pictures and small enough to fit in a yard. Alas, it appears only Bob Taggart of Chaparral Communications has really solved the shipping problem. He knocks his ten foot down into four packages that can be shipped UPS or parcel post for around $60 worst case. Others are trying to ship whole 12-13 footers with delivery fees of $600 or more. Cutting the antenna in half makes the boxes smaller but it still costs a bunch to ship these 'big' sections.

For the life of me, I can't see why anyone would spend say $1500 for a 13 foot antenna and then spend another $500 or more to get it shipped to them, if they had an alternative. **Cottage industry' could provide the alternative.** Simply let 50 people take Nelson's plans in the new manual and each start building antennas for local delivery. If you really operated tight like Susan and I do, you could turn out one antenna per week once you got the hang of it. If you spent $500 in materials and finishing, that would make you $1,000 a week for your efforts. You could even afford to cut the price below $1500. Moreover, there's room in the business for not 50 but perhaps 500 such individual 'cottage industries'. This whole field is growing, in case you haven't noticed!

Antennas are but a single example. The new **Gibson Satellite Navigator Manual** from STT has several very innovative terminal test instruments and dozens of really creative antenna mounting and rotation system ideas; completely worked out for duplication. I know Steve Gibson isn't going to go into the production of these; I would urge others to look at what Steve has pioneered with an eye towards starting a 'cottage industry' in their own cottage.

I can tell you from experience that being a 'cottage industry' is both frustrating and rewarding. The big reward is the complete control you have over your own destiny. You probably won't become independently wealthy (we certainly haven't!) but you will probably do better than you would at an 8-5 job. There are tax advantages as well that you'll probably need advice on; everything associated with TVROs you might acquire for example become expenses or depreciable.

No, I am not advocating putting the national antenna folks out of business. They'll do alright or fold without any help from me; either way. **But there's room here** in both antennas and 'gadgets' for an ambitious person to get off on his own and away from the shackles of an 8-5 routine. Think about it; the time to do something is now!

OUR COVER

Making Moniya play. It started with assembly of an 11 foot ADM dish aligned on a 'strange' polar mount bearing of 22 degrees from Oklahoma and ended with successful acquisition of an entire string of Molniya inclined orbit satellites transporting television from Moscow to more than 10 time zones in the USSR. When it's 8 AM in Siberia it is midnight in Moscow and 4 PM 'yesterday' in Oklahoma! Thanks to volunteers Tom Gardner and Larry Fansler for their devotion to the cause.

COOP'S SATELLITE DIGEST (Programming Section) is published monthly by Robert B. and Susan T. Cooper doing business as Satellite Television Technology (Ltd.), P.O. Box G, Arcadia, OK 73007 (USA); 405-396-2574. **CSD** is not affiliated with any satellite programming distributor, hardware (equipment) manufacturer or distributor nor satellite systems operator. STT sponsors the Satellite Private Terminal Seminars (SPTS) held three times per year and does produce and distribute 'learning' materials and 'how-to-do-it' manuals relating to the development of the low-cost satellite TV receiving system industry. Subscription fee is $50 (US funds) in advance Canada, US, Mexico; $75 (US funds) elsewhere. Copyright 1980 by Robert B. and Susan T. Cooper.

SUCCESS WITH MOLNIYA JUST IN TIME FOR MOSCOW OLYMPICS

GETTING RUSSIA'S BIRDS

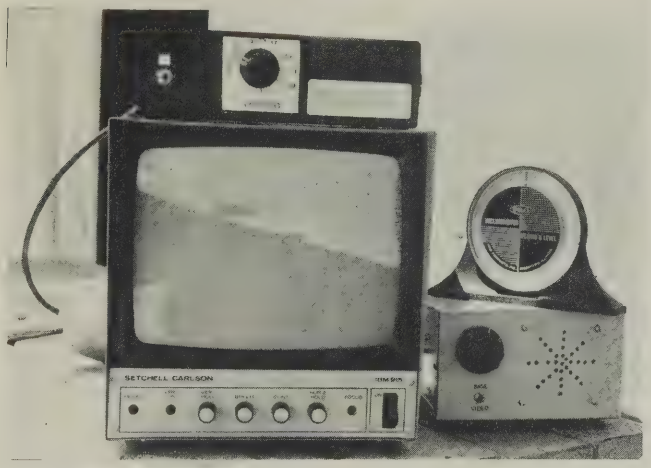
There is an old saying that if it is fun to do it must be indecent, immoral, illegal or fattening. This thought kept coming back to mind as Tom Gardner and I cranked the 11 foot stock ADM antenna around and about through a carefully pre-calculated hunk of northeastern sky searching for the MOLNIYA inclined orbit TV-carrying Russian birds. Here we were, some fifty or so feet north of the (to us) huge 20 foot, 3,000 pound USTC dish which had sat in its place in the side yard for nearly three years now gently pointing south towards the Clarke orbit belt...parked on a concrete slab with an old table filled with modern electronics gear and a satellite antenna pointing 'the wrong way.' The day was warm but not nearly as hot as the prior day when we managed to get the ADM checked out on 9 different US/Canadian birds. Stacked up on the table was a Sony PS1850 tri-standards color monitor (with switch selectable NTSC, PAL and SECAM color standards), a Sony 8 inch NTSC video monitor, a Kenwood R-1000 0 to 30 MHz communications receiver, a Microwave Associates LNA power supply, various pieces of test gear and the smallest box on the table - our prototype SAT-TEC 24 channel TVRO receiver.

The SAT-TEC receiver (see separate equipment review/report this issue) had arrived on a Friday. When I handed it to enthusiast Gardner the next day he turned it over in the palm of his hand and muttered "I think I could get this into my coat pocket!". Later that day it proved itself against everything else we had in the house at the time including a $7,000 super-threshold extension receiver from a prominent international manufacturer.

Having proven the terminal on Saturday on domestic birds we started off on Sunday morning by swinging the antenna Mount around 180 degrees. We had scribed a north-south (true) line on our concrete slab and it was a simple task to re-align it as if the Clarke orbit belt was north rather than south of us. I had tacked on the side of a tool shed a carefully drawn diagram provided by English experimenter Steve Birkill. Steve had taken the time to help this bunch of 'Yanks' look for MOLNIYA by calculating where his own observations indicated the Molniya orbit should 'apogee' from our Oklahoma vantage point. The heading would be 60 degrees up and 22 degrees east of north. The frequency would be 3875 MHz; roughly transponder 9 in the domestic service.

Using an inclinometer and a compass we calculated and adjusted the antenna to the expected apogee point and turned everything on. Nothing. We time noted 10:30 AM. However we would probably have fallen to the concrete had we found something first shot since the Molniya birds are moving all of the time and they would actually be in the top of the apogee loop only for an hour or so and it would be 5 to 7 hours later before the next one came along in that same spot. So we began to systematically search the sky either side of the Birkill-projected coordinates. Steve had drawn the six hour portion of the orbit for us and he had even taken a red pen and outlined a triangular shaped area of the sky where we should look since he admitted his calculations could be 'off' by as much as +/-5 degrees. Unlike the Clarke orbit birds where you have to determine elevation from your location and the azimuth to a fixed point in the sky, we were looking for a **moving target** and our English instructor admitted he could be off over a 10 degree span.

Since at this point we were optimistic and fully believed the 100% accuracy of Birkill's navigation we decided the first search should be from the projected apogee spot downward in both directions. MOLNIYA is known to transmit for six hours per bird on the above-Canada apogee; three hours on the ascending pass towards apogee and three more on the descending path. So we tracked first one and then the other a 1/2 degree at a time turning and twisting the elevation jack control on the ADM antenna and them sweeping the antenna a couple of degrees left and right in azimuth after each new elevation setting. Nothing.



BASIC MOLNIYA INGREDIENTS [less antenna!] - a black and white monitor [yes - that's a Russian test pattern faintly visible], tuneable receiver, an 'audio box' and the most important tool of all...the inclinometer!

By 1 PM the possibility that Birkill might be correct with his own suggestion that his figures might be + /- 5 degrees was becoming more and more likely. But we **had managed** some success; which only tended to confuse us more. On one azimuth sweep that had us pointing perhaps 10-15 degrees **west** of our 22 degree (true) intended boresight **we had found a carrier.** It turned out to be on about US transponder 13. When we came across it the screen darkened on the Sony monitor and as Gardner fine-tuned first the elevation and then the azimuth we could see virtually all of the 'sparklies' disappear. When we

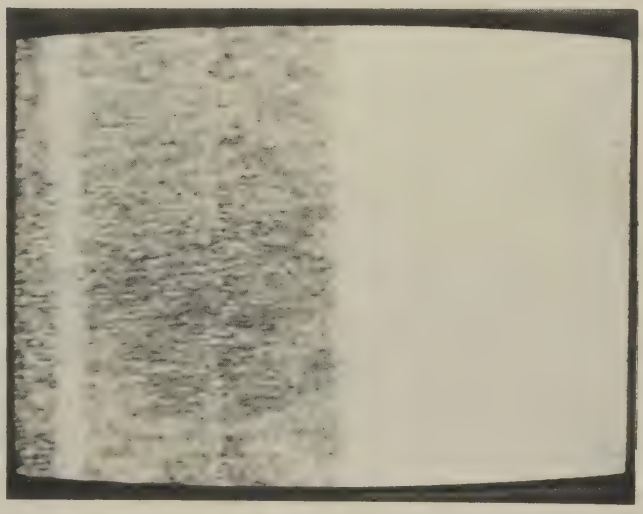
TROPICS? From Oklahoma MOLNIYA doesn't turn off on some orbits until the antenna is operating at an elevation of 74 degrees nearly overhead!]. We decided that alone was kind of scary...Russian TV live from Moscow right above us.

BIRKILL HYBRID MODE FEED - Tom Gardner studies the SMA fitting installed by Steve Birkill on his circular polarized feed deciding how we would get a bulky N type fitting on the tube in place of the small SMA.

first found it, we thought for an instant we had our MOLNIYA TV bird. Then the reality that we were perhaps 100 MHz **high** for MOLNIYA TV at 3875 MHz sank in and we went to work figuring out what we did have. First of all there was no sign of video modulation; no sync, no framing. **But there was a signal.** So unhook the video monitor and plug into the Kenwood R-1000 communications receiver. Any carrier fat enough to almost wipe out the sparklies had to have some intelligence on it someplace!

We found a raspy sounding, 50 Hz modulated carrier at 1701 kHz. But nothing else. We were still not sure we didn't have MOLNIYA TV since by now we had been on this signal source long enough to have noticed that it was indeed moving through the sky. If it was not a MOLNIYA **TV** bird, it **was** another MOLNIYA family bird on an inclined orbit!

Over the course of the next hour we found five such birds; each in a pathway that suggested some were but 30 to 45 minutes apart in the inclined orbit chain. All had the 1701 kHz frequency carrier. Two we found **also had** carriers at 384 kHz. (NOTE: These 1701 and 384 KHz carrier frequencies are what you get **after** receiving the incoming 4 GHz range signal,



PULSE AND BAR pattern was first 'video' seen. This was using standard ECA linear horn on feed, 180 degree K LNA, ADM dish and SAT-TEC receiver. Not great but we were plenty excited!

frequency convert them down to 70 MHz, demodulate the carriers and then take the baseband (0 to 4.5 MHz) output from the SAT-TEC receiver and run it into a communications receiver tuning the 0-30 MHz range. The actual RF carrier frequency would be much closer to 3975 MHz.) While tracking one we heard it start 'quivering' as if the satellite was either spinning or the inosphere was scintillating the downlink signal. After it waivered for perhaps ten minutes the carrier suddenly turned off. Hummm.

Well, as interesting as all of this was, we sure weren't watching the Russian Ballet which had been our objective. So back to the drawing board. OK - we had found five birds, none with TV on them. They were all moving (as evidenced by our constant need - every ten minutes or so- to repeak the antenna) and they all had the same 'sound' and pattern in the sky. It bothered me for awhile that the two AO carriers (1701 and 384) were 'common to' a couple of the stronger 'mixer carrier frequencies' one finds on most Bell operated Telco links but I had never heard of a Bell Telco link moving through the sky so quickly dismissed the possibility that we were experiencing terrestrial interference. The 50 Hz 'gargle' of the 1701 kHz carrier pretty much cinched it even if the MOLNIYA type orbit we noted was not sufficent evidence.

We knew this particular orbit train was west (in our sky) from where Birkill had said we **should find** the MOLNIYA (type) 3 TV birds. We went back to the portion of the sky where Birkill said we should look...and looked again. Still nothing.

Now Tom Gardner had been fighting the ADM antenna mount for almost two solid days at this point. As nice as it is, the never intended it for extensive sky searches a sector at a time. And having the antenna mount aligned for **true north** when the bird's paths were predicted to be 22 degrees **east of north** was a big hassle. This meant that everytime we made an elevation adjustment followed by an azimuth sweep we were **not really** doing a straight east-west (or west-west) sweep; the sweep was more of a letter'U'. We had rationalized that this **didn't really matter** since sooner or later, if we did systematic sweeps after each 1/2 degree adjust of elevation, that we would simply build a 'stack of ''U'' 's' across the sky and catch every part of the Birkill triangle.

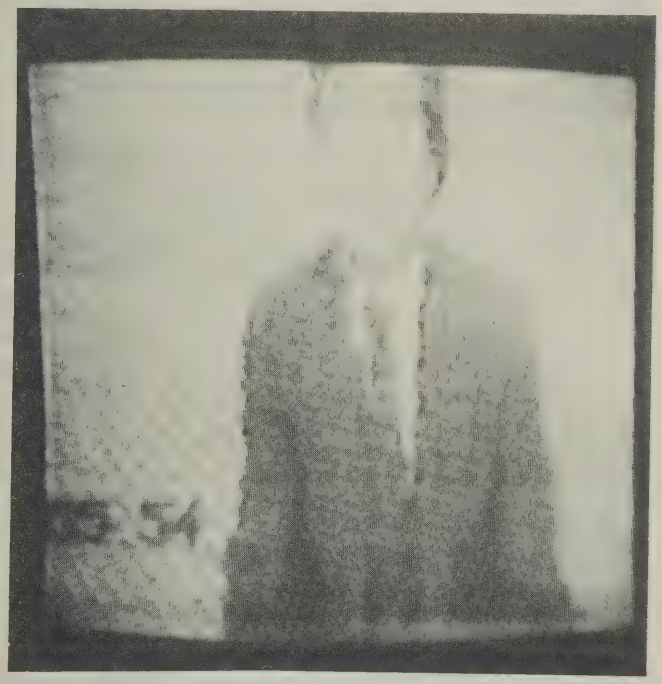
Gardner finally decided he wasn't going to 'buy that' line of reasoning any longer and so we drew a new line on the concrete slab; it ran from 22 degrees straight back to 202 degrees. Then we huffed and puffed and jockeyed the 500 pound antenna plus mount around so it looked **straight up the 22 degree heading** line.

''Now let's start over'' proclaimed Gardner. Five minutes later we had MOLNIYA TV on the screen. It was 3:25 PM CDST in Oklahoma and 11:25 PM the same day in Moscow. Apparently the Russians go to bed early; they were transmitting a Pulse and Bar test pattern!

Well now, this was more like it. We checked the azimuth and then the elevation. The bird was 65 degrees up and 20 degrees east of north. A quick check of the Birkill data revealed we were not only inside his 'red box' but **we were dead-on** for a bird that was in the descending node and about 3 hours out of apogee. And so we tracked it. Yes, every ten minutes or so we had to readjust the elevation and then the azimuth although the elevation was where most of the activity was. By 3:52 PM it had moved to a location 69 degrees above our horizon and 22 degrees east; in about 30 minutes it had changed by 4 degrees of elevation and 2 degrees of azimuth; plus or minus our crude navigation equipment! Again we checked the Birkill data; no question now, the bird was going away from apogee and would in short order be at the edge of the red-marked zone Birkill had drawn for us (boxing in the 6 hour average active-period of each MOLNIYA in the train). At 4:17(09) they dropped the test pattern but held onto the carrier. There on the right hand edge of the screen was the wavy black line caused by the Pulse Width Modulation (PWM) getting into our American standards receiver. At 4:18(29) the Pulse and Bar display returned. It stayed up until 4:24(58) and then they returned to the unmodulated carrier. At 4:30(00) the bird left the air; precisely as it crossed over the red-perimeter line Birkill had drawn on his graph for us!

A few words here about this whole system might be in

order for the newer readers of **CSD.** The Russians have two separate satellite systems operating; one, like our own and INTELSAT (etc.) hangs out over the equator in Clarke/geostationary orbit (the Russians undoubtedly have somebody **they claim** dreamt up the geostationary orbit belt before Arthur C. Clarke did in 1945!). The nearest such bird to North America at the present time is the Ghorizont (loosely translates to 'Horizon' in English) at 14.5 degrees west. Then they have the inclined-orbit system called MOLNIYA which comes over the top of the world at us from our north. At the MOLNIYA perigee (closest point to surface of the earth) it is approximately 580 km up; very close. At the apogee it is some 39,800km up. The apogee interests us because this is the portion of the pass which the Russians utilize to transmit a single channel of national television over all of Russia. And **the sub-satellite point** (i.e. the point on the earth or ground where the satellite is directly overhear) is at roughly 63 degrees north and 80 degrees west. That's dead overhead for a spot on the map called Mansell Island in the northern Hudson Bay of Canada.



TALL, SKINNY RUSSIANS! If you fail to adjust your vertical linearity the Russian 625 line/50 Hz based 25 frame per second rate will elongate the people. Note the Moscow time 'supered' lower right; 05:54. That's 1:54 PM in the afternoon in Siberia where this transmission is beamed and 9:54 PM 'yesterday' in Oklahoma! The man is delivering a news brief, or 'Novosti'. They sure mention 'Carter' a lot!

Because the inclined orbit birds move, you have to track to stay with them. Fortunately they elect to utilize the apogee for TV broadcasting and the apogee is so positioned that for an hour or so right at apogee the bird moves less than 1 degree; you hardly have to adjust the antenna at all. MOLNIYA transmits TV for three hours before and after apogee and then as the particular bird you are watching shuts down another bird enters the apogee zone and switches on; as the other bird is entering the six-hour apogee period.

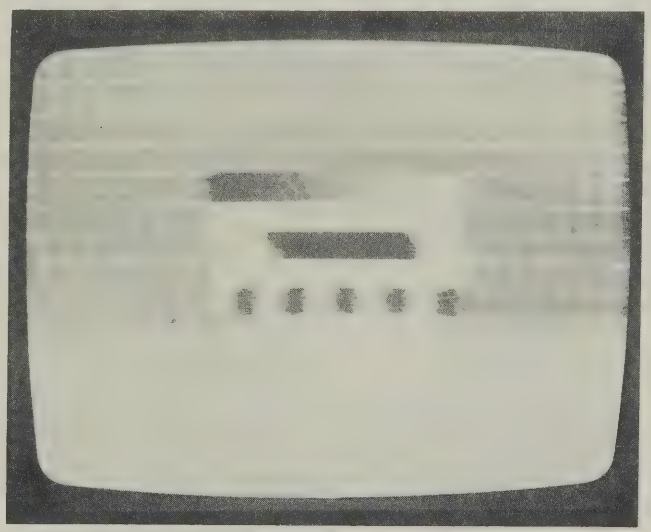
If you can point your dish to a spot in the sky directly above Mansell Island in the northern Hudson Bay at an elevation that is 39,800 km above that sub-satellite spot, you'll be watching Russian TV pretty soon!

Now we found that in addition to television we could also hear AO (unmodulated) carriers in the baseband region on five frequencies: 108, 124, 140 plus 170 and 186 kHz. Yes, we see the 16 kHz 'pattern' to them and no there was no sign of TV 'sync' information on these carriers.

Birkill, who has been watching Russian television for several years, says that except for a few hours per day of test patterns the Russian MOLNIYA 3 series birds are carrying video programming all of the time. Our first encounter just happened to be one of those periods when test pattern was 'up'. Audio? Well, that takes a pretty elaborate system for MOLNIYA (see complete description in April and May **CSD**) although Ghorizont requires just a sub-carrier detector capable of tuning to 7.5 MHz. We haven't gotten that far yet.

WITH THE HYBRID MODE feed installed we were in tall signal! Gardner decided the best way to insure the bulky scalar-hybrid mode feed stayed exactly at the focal point would be to build a wooden **'lattice' works around it. The LNA connects directly to the N connector on the feed with a male to male N Amphenol fitting. Pretty it is not; work it does [our apology to Steve Birkill for 'desecrating' his beautiful feed in this manner!].**

There are some strange (as in unexplained) facets of Russian MOLNIYA television. This is thought to be their national 'Moscow' service channel. Now Russia (or more properly the USSR) extends from Latvia on the west to Siberia on the east; that takes in more than 160 degrees of this circle we call earth. And that includes around 10 time zones. When it is



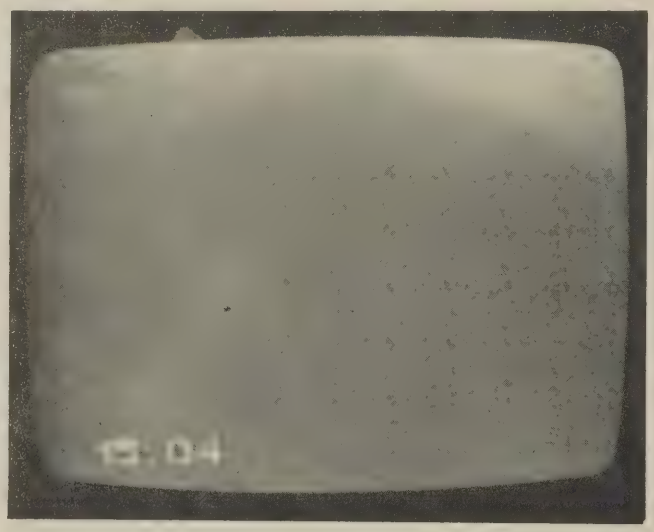
STANDARD RUSSIAN TEST PATTERN - notice the black center rectangle; no sparklies! With the hybrid mode installed we were out of 3.7/4.2 GHz 'sparklie noise' although our baseband system still had some fine-grain video noise in it. We estimate Russian EIRP to be in 32-33 dBw region into USA.

10 PM in Latvia (the western edge) it is 8 AM in Siberia. Which explains why the 'Moscow Channel' via MOLNIYA is active virtually 24 hours per day. Yet, as Birkill notes, after Moscow closes down their own 'time zone' service around 9:30 PM Moscow time (which essentially closes the service shown for Moscow-west to Latvia) about 60 to 90 minutes later the service renews again except now it is transmitting children's programs such as you would see here in North America at early to mid-morning. It (fits) that in Siberia this would be the early morning (i.e. traditional children's TV programming) period; but, as Birkill notes, they run electronic clock 'supers' on the screen and the time shown is Moscow time (around midnight!) Why they run Moscow time for the kiddies 8-9 hours east is abit baffling to say the least.

The Equipment Required

We went into this figuring **if** we could produce video with an 11 foot ADM antenna, a 180 degree K LNA, linear polarized feed (**MOLNIYA is right hand circular polarized** and when you capture it with a linear feed you give up 3 dB of signal right away!) and a stock home-type TVRO receiver, we would have proven that you don't need to be the CIA to watch Russian TV in North Averica. We did just that. Not great pictures mind you (around 3-4 dB CNR at first) but watchable.

From those first May 18th tests have come many more tests and a firm handle on what it will take to produce reasonable high quality Russian TV virtually anyplace in North America.



15:04 IN MOSCOW [7:04 in Oklahoma]. Programs generally start on hour, may end at odd points. If program ends after half or full hour point, they may transmit screen only with time 'supered' or they may revert to test pattern until the next 'natural' start up point comes. They don't fill the carrier with TV programs constantly, even during 'broadcast' segments.

a) **Antenna** - We recommend a 16 footer equipped with a right hand circular mode feed. The antenna surface you can find on your own; the circular feed is best duplicated out of the February 1980 **CSD** (Birkill Hybrid Mode Feed) or as printed in the Coleman TD-2 Conversion Manual. Yes, an 11 foot will work and if equipped with a right hand circular feed will produce fair (if not perfect) pictures.

b) **LNA** - any standard 120 degree K LNA will do just fine.

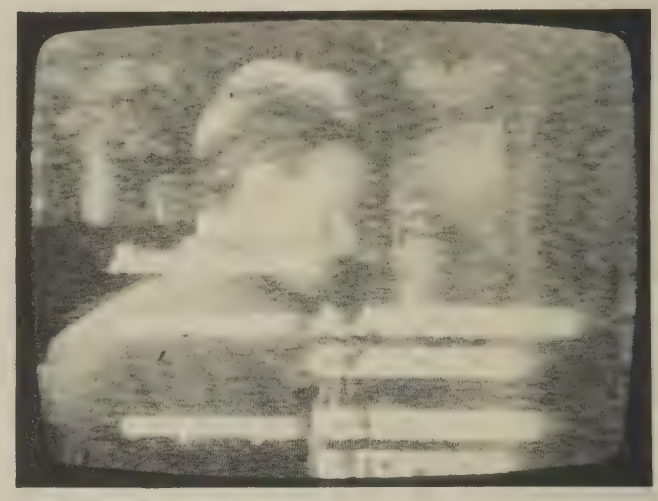
c) **Receiver** - Any phase-lock loop demodulator will produce good video. The April and May **CSD'S** told you to get audio but since it is only in basic Russian you may not want to fool with it.

d) **Monitor** - if you plug into a standard (North American) NTSC monitor you will notice all of the Russians are tall AND SKINNY. They aren't really; you need to readjust the vertical linearity (about 17% down) to compensate for their standards. You'll have a waivery ragged black edge on the right hand side of the screen: ignore it.

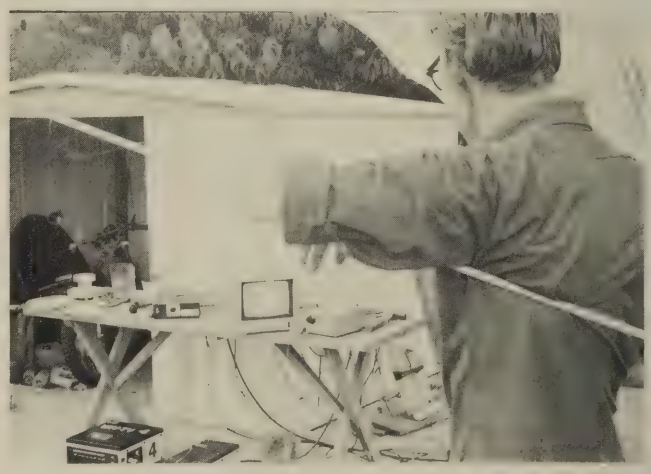
e) **Tracking** - From reading this you now know where the Sub-Satellite point is located.

With the 16 foot antenna et al suggested, you'll have high quality (in the 40 + signal to noise ratio class) video. Don't try running the video into a tape recorder: even though your NTSC monitor will produce tall , skinny Russian people your VCR won't 'copy' the strange sync signals present. We simply did a 'transfer' by shooting the video directly off the TV screen with a camera (that is the least expensive 'standards conversion' system of all!).

For the high technology types, we are still quibbling over



RUSSIAN 'period-plays' set in late 1800's and early 1900's are popular themes. The 'noise' you see is not actually in the TVRO system but rather in our Setchell Carlson video monitor (i.e. it is baseband noise, **not** RF nose). **Very fine grain, we eliminated it by building up a series of baseband filters following data in Washburn Manual to keep all TVRO receiver 'noise' demodulated above approximately 4 MHz out of the video input to the monitor. Extensive discussion of suitable monitors appears in** Coop's Satellite Operations Manual **just released by STT.**



ENJOYING FRUITS OF LABOR - **"The Molniya 4 PM [CDST] newscast scares the pants off of me" says Gardner. "Their Afghanistan news film is bad enough; but when I see US news film showing US protest marchers carrying signs promoting America 'admitting' her 'crimes' in Iram or protesting US abstention from the [Moscow] Olympics...well, no telling what the announcer is saying when that film is rolling."**

what the MOLNIYA global beam antenna pattern EIRP might be. First reports (years ago) suggested 29 dBw. More recently Birkill ran across some data that suggested it would be around 31 dBw at **beam edge** and 34 dBw at boresight.

Our checks suggest that the 34 dBw number is closer to being correct; but you have to back 3 dB out of that for a linear feed (i.e. effectively a 31 dBw level). We are still checking and cross checking and we ll all come to a conclusion on this one day. For now we know a below-par system **will** copy the signal.

For the super spies out there, unresolved is the question of what in the world that 'other MOLNIYA' track set of satellites we first copied might be (as noted early in this report). Also unresolved is on what MOLNIYA system is the US-RUSSIA (Washington-Moscow) backup 'hot Line'. There are two 'Hot Line' circuits in use via satellite; one via one of the MOLNIYA familiy and another via INTELSAT. Wouldn't you just love to hear some U.S. technician saying "Hello Test - Moscow" on MOLNIYA some day!

("Aaah Mr. Chairman, this is Jimmy Carter. Do you have a few minutes to chat about those missiles you people are erecting around Guantanamo Bay?")

EQUIPMENT REVIEW
SAT-TEC'S $995
TVRO RECEIVER

THE SAT-TEC GOODIE

Those who traveled the road to SPTS '80 in Miami looking for an off-the-shelf supply of good working home satellite receivers to truck back to Oshkosh (or whereever) were understandably disappointed. Few of the receiver suppliers to the industry were really ready to talk about large orders (actually everyone **talked**; few could deliver) and possibly this failure on the part of the receiver supplier exhibitors present has had a major part in contributing to getting fewer dealers than we anticipated off the ground before SPTS '80 San Jose.

This is primarily a review of the construction and performance of the new SAT-TEC $995 (list price) 24 channel receiver. But interwoven into this report is a message for all would be dealers and distributors. Read carefully.

There are three ways to build satellite TV receivers. All have manufacturing advantages, some may even have performance advantages. The first trick is to get the 3.7 - 4.2 GHz satellite TV energy away from 3.7 - 4.2 GHz in as big a hurry as possible. Why? Because anything you do to the signal at 3.7-4.2 GHz is dangerous and it requires that you utilize component parts and sub-assemblies that are in very short supply. And they are expensive.

Andy Hatfield's AVCOM receiver, for example, follows what might best be termed 'conservative, traditional design approaches'. Andy realized nearly 18 months ago that his receiver would only be viable on the market if he was able to design it and then duplicate it with reasonable speed. He opted to do his 3.7-4.2 GHz conversion work utilizing aprts that he didn't have to wait long periods of time to get and he on purpose stayed away from long-lead time, hard to acquire sub-assemblies.

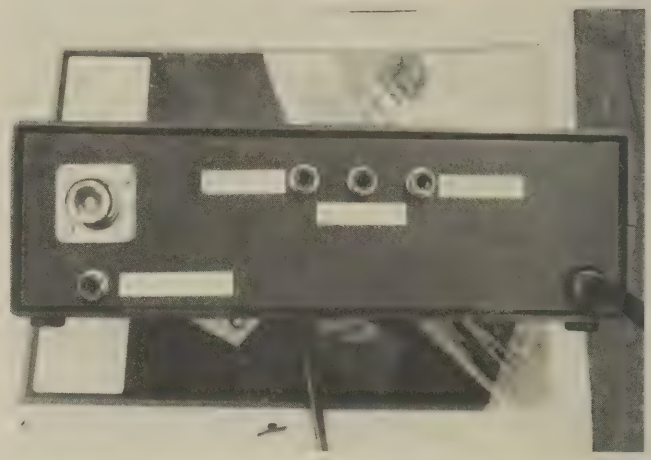
Taylor Howard, approaching the same problem nearly 18 months after Andy, came to a similar conclusion. In Tay's case his new commercial version receiver would not have either of the two hard-to-get long-lead-time sub-assemblies that were hanging up so many others. Tay designed his own doubly balanced mixer (whereas many are using the VARI-L DBM-500) and then after he discovered that AVANTEK could apparently not deliver to he and his cohorts 10,000 8360 VTO local oscillators over a period of a year, he set out to design a replacement local oscillator.

What does all of this have to do with the SAT-TEC receiver? Well SAT-TEC took the **third** approach; they carefully looked at every single part in the typical satellite receiver, identified the same two parts that have been hanging everyone else up as well, and then by using a combination of clever engineering (designing around parts that had no

SATELCO- High Quality Private Terminals
SPECIALISTS IN OVERSEAS systems for domestic and Intelsat television reception, fast processing of export orders and design and sytems for 'difficult' reception areas. Antennas from 10 to 20 feet available.
PLUS - currently closing out inventory on a popular brand 10 foot TVRO parabolic (and some associated electronics); **we can save you real money** whether foreign or domestic buyer!
SATELCO- 5540 West Pico Blvd. Los Angeles, CA 90019 [213] 931-6274

EAGLE
SPHERICAL SECTION ANTENNAS
10, 12, 16 Feet
To be introduced at SPTS '80 Calif.
Moderately Priced
Wagner Industries
Box 559, Alva, Ok. 73717
(405) 327-1877

SELECT YOUR CATV SYSTEM
Satellite Programming
INTELLIGENTLY...
...with **SAT-Guide**
Twenty channels of programming today on F1, soon 35 on F1 and D2. Keeping up with what is 'up', when, is almost impossible Until SAT-Guide
ALL F1 programs on **all** transponders are listed in this unique programming guide to satellites INCLUDES daily program listings PLUS monthly summaries of movies, sports and specials. Only $28 per year from
SAT-Guide P. O Box 1569
Division of Commtek Hailey, ID 83333



business being there in the first place) and clever parts sourcing (the art of locating parts when nobody else can) they designed the SAT-TEC receiver shown here.

The receiver measures 8 inches wide by 6.25 inches deep and 2.5 inches tall. It weighs 2.5 pounds (!) and fits into a slim-line briefcase. Operational features are as follow:

1)**Channels** - tunes all 24 channels with some apparent outside of band overlap on both ends (perhaps 30-50 MHz).

2)**Outputs** - One baseband video (ready to drive a monitor or an RF modulator with 1 volt peak to peak video), two audio subcarriers (one for 6.2 and one for 6.8 MHz although they could be tuned by you or at the factory for for subcarries in the 5 to 7.5 MHz region).

3)**Accessory jack** - a 15 volt DC powering jack to plug in your LNA.

4)**Operational controls** - One on-off switch and one channel tuning knob.

The unit you see here was a prototype; it differs from the production models only in that the front panel channel tuning dial is hand drawn and the lettering is either typed on a label or hand drawn. Other than that, our unit is just like a unit that you might get your hands on.

SAT-TEC resolved the VARI-L (DBM-500) mixer problem by entering an order for one heck of a bunch of the devices. In short, they got the supplier's attention. Where smaller purchasers are having difficulty getting their smaller order filled, SAT-TEC is having no problems.

The microwave region (3 GHz range) high local oscillator is not an AVANTEK 8360 like many other receiver manufacturers have attempted to use; rather it is a Watkins-Johnson (WJ) V802 LO source (tunes 2.5 to 3.7 GHz). There are several advantages to the WJ unit, if you are SAT-TEC:

1]It has a lower set of FM sideband noise figures than the **published** spec on the AVANTEK 8360 (FM sideband noise is unwanted noise that comes out of the oscillator and can in severe cases degrade the performance of the receiver noise figure);

2]With everyone else in the field apparently buying or **trying to buy** from AVANTEK, by dealing with WJ SAT-TEC has been able to get a pretty decent supply of the hard to source high LO.

We don't like to dwell on the mis-fortunes of locating parts for volumes of (relativeiy) low-cost home receivers but if you are a dealer or distributor (or would-be either) you had better understand going in that tying your fortunes to a receiver that can't be semi-mass-produced with regularity is not in your best business interest. A receiver supplier that seems to have his own supply lines well in hand is going to be a supplier that you can live with, happily, much-much longer!

NOW - how well does the SAT-TEC receiver work?

The receiver arrived at **CSD** just as we were putting the finishing touches on our initial MOLNIYA reception project. We already had a super-deluxe threshold-extension CATV/broadcast professional reciever on the outdoor table to use for our MOLNIYA search and since we were going to do a preliminary system check out with the 11 foot antenna sweeping across the US/Canada satellite belt it seemed like a good point to do some quick checks on the SAT-TEC as well. Here are our observations:

1]In spite of the much tauted threshold extension feature on our high dollar comparison radio, the SAT-TEC had every bit as much receiver sensitivity as the brand 'M' radio. By pulling the 11 foot antenna off the satellite by 1 to 1.5 degrees and thereby reducing the satellite signal to the receivers by a considerable amount, we could not tell **which** radio first held sync and first passed color; it was a dead-heat. **Audio recovery** on the the $7000 radio **was** a tad better, especially under extremely weak signal conditions, but the difference was far from dramatic.

2]On very strong signals and saturated colors (such as you find with color bar transmissions or quick transitions from bright red to a lighter color) the $7000 receiver had a picture-sharpness edge. Probably not $6,000 worth however!

The SAT-TEC receiver, like so many now available in the private TVRO field, uses the tried and true phase lock loop (PLL) demodulator; the NE 564. As **CSD** has discussed several times in recent months, there are things about the 564 PLL which make it less than a totally perfect demodulator tool for video. Most of all, it has difficulty accepting the full FM sideband energy present up to the point where 99% of the power contained in the FM video carrier is found. The PLL doesn't just naturally like to 'track' up into the 8/9/10 MHz deviation region and when a saturated color appears on the screen it is in the upper frequency portion of the demodulated waveform that much of such energy appears.

Prodelin's New Segmented Earth Station Antennas

The first antenna to put it all together.

Never before has anyone combined all these features in one antenna:

ALL PARTS 100% INTERCHANGEABLE
Interchangeable segments automatically self align. No special tools needed to erect.

REDUCED WEIGHT
10 foot dish weighs only 140 lbs. Shipping volume under 60 cubic feet. Means big savings on shipping costs.

HIGH GAIN 40 dBi

CAN BE HAND CARRIED UP TO A ROOF!
For example the ten footer's 8 petals weigh under 15 lbs. each. No cranes needed. Send the antennas up by elevator or the stairs!

A NEW GENERATION OF SEGMENTED, LIGHTWEIGHT, FIBERGLASS ANTENNAS.
Tough, resilient, "forgives" rough handling. Available in sizes from 4 foot to 5 meters.

AVAILABLE RIGHT NOW IN MAJOR QUANTITIES.
100 units-per-day capacity, plus East and West coast warehouses, assures rapid delivery.

PROVEN SURVIVEABILITY
Materials tested and approved in accordance with MIL STD 810 B. Handles the roughest weather, including hurricane force winds and beyond (up to 125 MPH)! U/L approved fire retardant.

OTHER MAJOR FEATURES

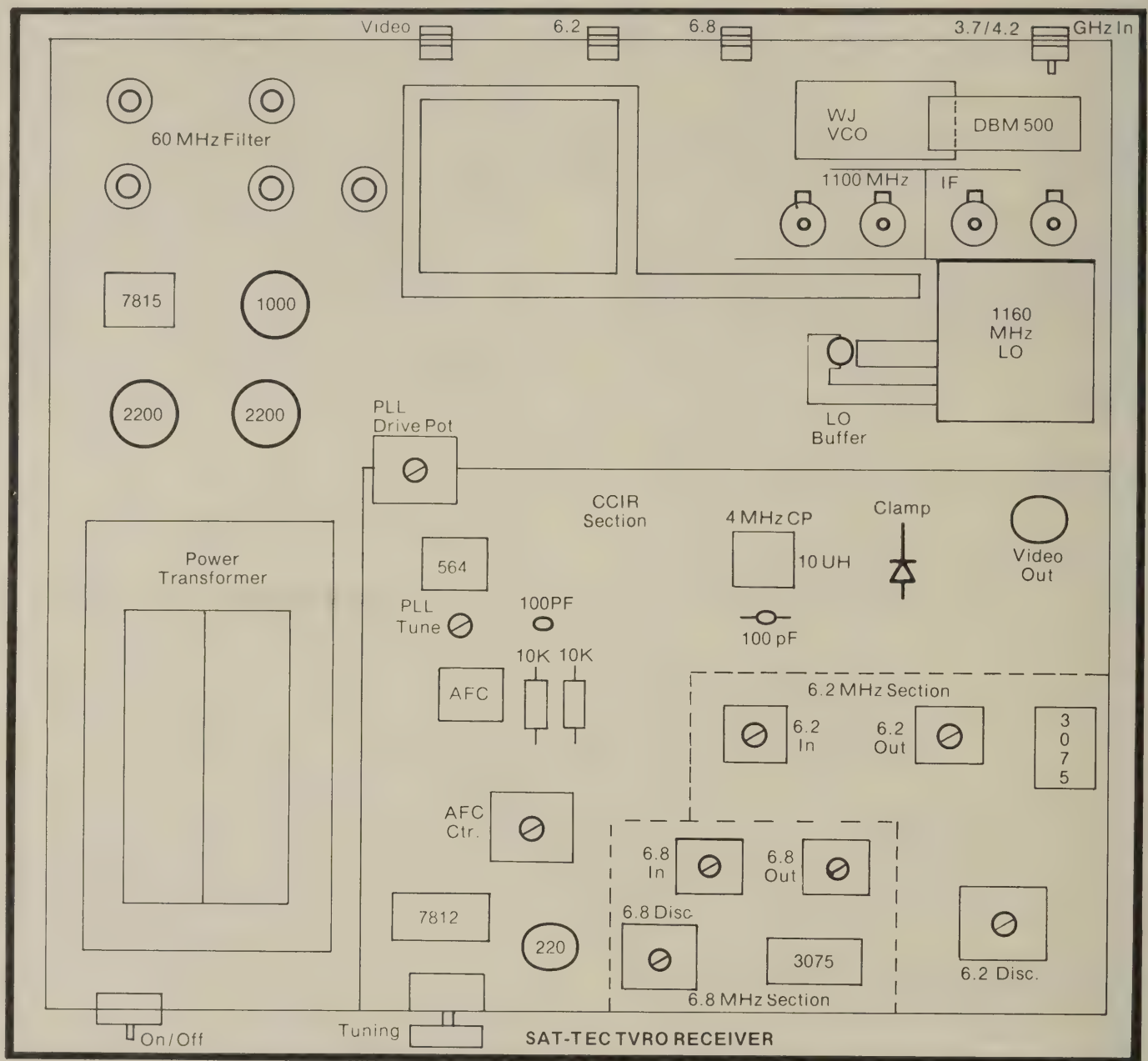
- Prodelin textured front surface diffuses solar heating.
- Unpressurized feed.
- Enclosed focal point LNA with polarization from the rear of the antenna.
- Plane and dual polarized antennas are available, all of which meet appropriate FCC requirements.
- Available in environmentally acceptable tones of green, white, tan.
- Self indexing flanges (Prodelin exclusive) eliminate guide pins, add to simplicity.
- Interchangeable fiberglass segments have their own inherent strength (unlike fragile aluminum segments).
- Antenna sheds ice so easily in most locations, it's considered virtually self-deicing. If ice does form it can be manually deiced with the rap of a mallet.
- Patent applied for.

Combine the first affordable, high-quality reflector (from the people who know how to build them) with the low-profile, hour-angle mount (from the people who know how to secure them) for the most desirable TVRO antenna system available. We challenge you to find a higher performance/cost ratio anywhere.

Prodelin®

TRISTAR GENERAL, INC.

4810 VAN EPPS ROAD
CLEVELAND, OHIO 44131
(216) 459-8535



On a PLL demod receiver you see this happening by noting that the saturated (bright red) colors seem to have poorly defined right hand edges; they may even 'tear' on you with the saturated colors 'bleeding' into the video to their right.

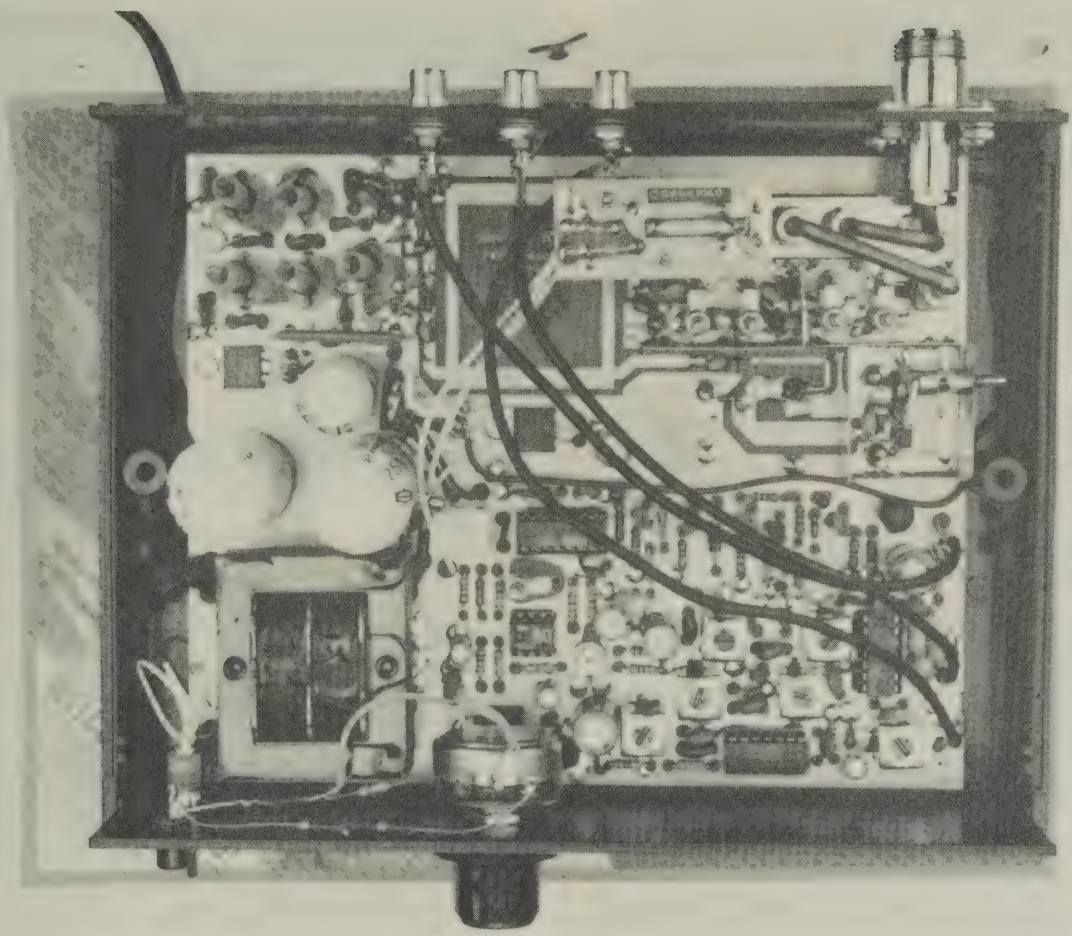
Some people maintain that careful (by hand) selection of the 564 devices plus some extra attention to baseband signal processing, filtering and amplification you can either improve or even cure this problem. When **we** see a 564 demodulator that has this problem **totally solved** under **any** and **all** conditions, **we'll be the first to tell you about it.** For now the 'problem' is present in varying degrees in virtually all 564 PLL receivers.

For the record, it is not a bad problem in the SAT-TEC; which means we've seen it much worse in others. Of course the trade off here, in using the 564 demod rather than the conventional discriminators (such as AVCOM uses) is some improvement in apparent system sensitivity. Evidence suggests that the 564 is a form of threshold extension all by itself and that performance on weak signals (as proven during the INTELSAT tests conducted during SPTS '80 Miami on the Brazil Rede Globo signal) is superior with a 564 or some other form of PLL demod.

Our critical eye found some of this PLL-bleeding with the SAT-TEC but several people who had never seen satellite TV before saw the pictures and said they were the best TV they had ever seen. Which only proves how spoiled one gets after living with high resolution 52 dB signal to noise satellite video for three years!

We ran the SAT-TEC, which is shown here in diagram form as well as photo form, for several weeks before writing this report. It worked **better than** the $7000 radio on the strange-to-America Russian standards signals from MOLNIYA; we think the complex 30 Hz energy dispersal waveform eliminator in the high dollar receiver didn't like the Russian Pulse Width Modulation audio signals which the SAT-TEC receiver largely ignored. We have the following operational observations:

1]The receiver sat outside in the sunshine for several straight days while we played with MOLNIYA. The black plastic case soaked up the sun's rays (it was 90 in



SAMPLE

the shade most of those days) and we worried about the unit getting too hot and either frying or getting unstable. **Neither happened.** There are probably more severe heat tests than leaving it in the bright sunshine all day, running, but we can't think of any a normal receiver is likely to encounter. We would like to see some ventilation however; it would just make us feel better. (The receiver in the sunlight understandably ran 'hot to touch', especially over the power transformer.)

2]There was some amount of tuning **dial** calibration drift over the course of the day when the unit was outside and getting hot. As it warmed up, the dial calibration drifted upward. Very slowly however and we don't classify this as a problem, only an observation.

3]The tuning, unlike some PLL demods we have worked with, is very smooth. There is no **one-critical-point** where the sparklies go from black to gone to white; it tunes smoothly from black to a broad no-sparklie to the white area. That't good.

4]If you want to tune in terrestrial (typically 4 MHz deviated) microwave video with the SAT-TEC receiver you'll have to ask the factory to tell you how to switch the the demodulator polarity. It involves cutting a trace on the board and either installing an extra switch or jumper. Remember, you are not supposed to be watching terrestrial microwave signals (we stumbled across some while looking for MOLNIYA and were momentarily puzzled why we could not resolve their video).

5]The receiver is rock (like in crystal controlled) stable. The AFC really works very-very well. We left it sitting on the MOLNIYA 3875 MHz center frequency for hours and hours with a T connector on the video output; one side of the T driving the video monitor and the other side driving a Kenwood R-1000 communications receiver. With the Kenwood we were tuning in MOLNIYA SSB and unmodulated carriers and for hours on end the SSB carriers stayed right where they were supposed to be. You can 'feel' the AFC grab ahold and lock in as you tune in a signal and it is a feeling of confidence to know that it is working well.

6]Although the video output is low-pass filtered to remove the audio sub-carriers above 4.2 MHz we found we had no difficulty going out of the video output into a Rohner sub-carrier detector tuned to the MOLNIYA 7.5 MHz FM signal. If we could do this all the way up at 7.5 MHz the lower sub-carriers would obviously present no probblems.

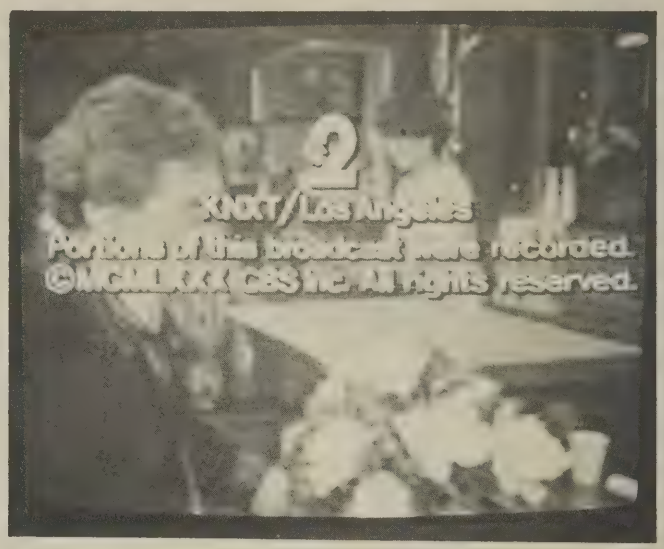
7]The plastic case bothered us at first. We still remember the experience in Miami where the proto-type Washburn receiver with a plastic case had gobs of RF bleedthrough problems from the local channel 4 TV station. **We also have a local channel** 4, barely 15 miles distant and line of sight to our outdoor work table where we ran the receiver during the MOLNIYA tests. **We had no signs of the local channel 4 at all.** Not a bit. We can't say that you could march up to the local channel 4 TV transmitter and hook up the SAT-TEC receiver and make it play without off-the-air bleed through, but in our case we found none.

We found the 6.2 and 6.8 MHz sub-carriers built into the SAT-TEC receiver right on the money; you could switch from SATCOM (6.8 typically) to WESTAR (often 6.2) and the audio was there at the appropriate spigot.

SAT-TEC (P. O. Box 10101, Rochester, N.Y. 14610; 716/381-7265) has a good product here at a good price. There's room in the pricing schedule for any legitimate dealer (i.e.

somebody who plans to buy say 25 or more per year) to make money carrying these receivers and the $995 user price makes it the lowest priced full TVRO receiver in the field at this time. The firm is not stopping here; a deluxe TVRO receiver is in development and we will be anxious to see what it does that the $995 package does not do.

SUB-CARRIERS AND SSB AUDIO CHANNEL BIRD RECEPTION



TRANSPONDER 23 on F2 is utilized early in day to transmit stateside programming to Anchorage where it is taped for later re-transmission to Alaskan Bush Terminals on same transponder. Here Los Angeles KNXT [news] is being sent to Alaska.

FINDING THE LITTLE FELLERS

The June (1980) issue of **CSD** explained that if you connect a communications receiver (capable of upper sideband/USB and lower sideband/LSB) antenna input to the baseband output on your TVRO (video) receiver, you in effect have a brand new 'spectrum' to tune each time you change transponders. That each transponder **not carrying video** is typically filled with precisely 4 kHz spaced "radio signals" that run the gamut from one side of (private) Telco voice links to a wide range of informational services including but not limited to:

a) Satellite re-broadcast of **AM** band radio stations **in Anchorage**
b) **Flight** (aviation) **weather** for much of the northwestern US including Alaska
c) (Private) television **network** 'communication lines' between network headquarters and field crews working on remote (video) pickups
d) National **Radio network feeds** for all major radio networks including National Public Radio (NPR)
e) A wide variety of **public assistance radio links** for Alaska including medical services, fish and game services, Alaskan legislature advisories
f) **News** 'wire' **services** from UP, AP, Reuters and others
g) Financial and commodity **reports** on both voice and teletype

The capacity of the present satellites to provide interference-free narrow band (audio or data) services spaced 4 kHz apart numbers in the millions of channels! One way to view all of this is to consider that each frequency modulated transponder (there are presently nearly 200 such transponders in North American domestic operation) is technically capable of in excess of 2,000 such voice-grade channels. In effect, there **could be** more than 2,000 4 kHz spaced voice grade channels on a single transponder if the first carrier was located at 4 kHz (0.004 MHz) and the last carrier was located in the 8,000 kHz (8.00 MHz) region. Each transponder then is a mini-frequency-spectrum to itself, capable of duplicating the entire radio spectrum from 0 MHz (DC) to 8 MHz.

Of course not all transponders are so configured (if they were we'd have no television!) since narrow band services and video cannot share the same transponder except when the video services occupy something less than a full transponder (such as with the Alaskan 1/2 channel format video seen on transponder 23 of F2). It happens that on common-to-TV buffs satellite FI we have two transponders 'dedicated to narrow band' (transponders 15 and 19). Other satellites however are far more heavily loaded with narrow band services.

Tuning in these services is duck soup if you have access to a suitable LSB/USB communications receiver. Around 85% of the services to be found will be tuneable on such a receiver operating in the **lower** sideband (LSB) mode after you do the following:

1] Switch your TVRO receiver to a transponder that has such services (i.e. 15 on FI is a good place to start);
2] Run a piece of coaxial line from the baseband-video output on your TVRO receiver to the antenna input on your communications receiver;
3] Place the tuneable communications receiver into the LSB position and start tuning as close to 100 kHz as your receiver will function, tuning upwards (higher in frequency).

NOTE: Many communication receivers have 500 kHz as their lowest **tuning range and they work upward from there to approximately 30 MHz. The Kenwood R-1000 receiver, a relatively new solid state unit, tunes down to 0 MHz** (0 to .2 with some reduced performance) **and up to 30 MHz.**

4] As you tune 'up the band' you will hear a brand new 'carrier' in 4 kHz steps; not solid across the spectrum but nearly so. Depending upon the time of day and the transponder, between 10 and 50% of these carriers will have voice or other data on them.
5] If as you tune you cannot 'resolve' the voice or data clearly, try switching to USB (upper sideband); as noted in the June report some Groups and Supergroups (or frequency blocks) of the spectrum may be transmitted 'inverted' so that the sideband use is reversed from lower to upper.
6] And, depending upon the transponder selected and the time of day, you will continue to find 'carriers' in 4 kHz steps all the way up to as much as 8,500 kHz (8.5 MHz) on the busier transponders although many are 'loaded' only up to the 4 MHz or so region.

While the news 'wire' (radio teletype) services require additional processing with an RTTY 'demodulator' and interfacing to some type of 'printer' that will display either a CRT copy or hard (paper) copy of the RTTY transmitted information, most of the 'services' to be found will be fully and finally demodulated as they come through the speaker on your communications receiver.

With that basic explanation, here are some of the things to look for:

1) **Transponder 15 / FI:** This transponder is one of the most heavily loaded in the sky these days **although** most of

what is here is of a purely 'private' nature. The first audible carrier will be around 92 kHz while the last audible carrier will be near 8433 kHz. LSB predominates although carriers between 313 and 481 kHz are USB. A major hotel chain has one side of their 800 number service in the 1634 (1638, etc.) to 1690 kHz portion. More hotel reservation lines in the 2182-2194 kHz region. Stock market reports are found on 1622 kHz. Uplinking from the Chicago area is found in the 6293 (USB) upwards region.

This is a good transponder to 'practice' on or get the hang of what this is all about, but there is (as noted) very little of a **public** nature here and the telephone conversations (of which there are hundreds of channels) are protected by the Privacy of Communications portion of the Communications Act.

2)**Transponder 7 / F2:** The RCA SATCOM II satellite has many more transponder dedicated to narrow band services and its 119 degree (west) location makes it an easy target for all of the USA and Canada. The first carrier on this transponder will be 102 kHz while the last or top carrier will be around 3282 kHz. Among the more interesting things to be found are:

a)**294 kHz** (LSB) - **Alaskan Forces Satellite Radio Net**
b)333 kHz (USB) - Anchorage radio station KBYR
c)**393 kHz** (US) - **Anchorage radio station KYAK**
d)958 kHz (LSB) - 'Soul' Radio Network
e)**1190 kHz - Alaskan Forces Satellite Radio Network**
f)1946 kHz - Kenai Flight Service Weather (at 15 minutes past the hour) for all of Alaska
g)**3246 kHz - Intercom line between remote Alaskan TVRO/ARO sites** (combo up and down links) **and network control in Anchorage.**

3)**Transponder 11 / F2:** The first carrier on this transponder will be 102 kHz while the last or 'top' carrier will be 3346 kHz. Included are:

a)**134 kHz** (LSB) - **National Public Radio service**
b)214 kHz (LSB) - Alaskan Forces Satellite Radio Network
c)**230 kHz** (LSB) - **Alaskan fisheries communications channel**
d)598 kHz (LSB) - radio network feed
e)**602 kHz** (LSB) - **National Public Radio service**
f) 814 kHz (LSB) - National Public Radio service
g)**946 kHz** (LSB) - **RCA Alaskom internal maintenance communications channel**
h)1182 kHz - Alaskan Forces Satellite Radio Network
i) **1234 kHz - Anchorage flight center communications**
j) 1498 kHz - Anchorage to Fairbanks 'enroute' communications (aircraft)
k)**1502 kHz - Alaskan Forces Satellite Radio Network**
l) 1562 kHz - Alaskan Forces Satellite Radio Network
m)**2366 kHz - Valdez [Alaskan] Weather Advisory service for all of Alaska**
n)2522 kHz - Anchorage radio station KBYR
o)**2686 kHz - Alaskan Bush Service medical assistance channel**
p)2754 kHz - Alaskan Forces Satellite Radio Network
q)**2802 kHz - Christian Radio Network**
r) 2854 kHz - Anchorage radio station KFQD

If you are interested in finding some of the (mainland US) national radio service feeds, here is a partial listing of where such services have been observed operating.

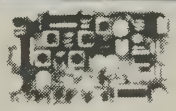
Transponder 16 of SATCOM FII: CBS Radio Network News feeds on **238** kHz (LSB); service goes to unmodulated carrier between news feeds. Philadelphia radio station KYW is found on **552** kHz (LSB). UPI Audio News for radio stations is found on **682** kHz (LSB) but reverts to unmodulated carrier between feeds. AP Radio Network is found on **700** kHz (LSB), reverting to unmodulated carrier when there are no feeds. NBC Sports for radio stations is found on **694** kHz.

Transponder 10 of SATCOM FII: AP Radio Washington is found on **950** kHz (LSB). Mutual Radio News is found on **2082** kHz (LSB).

Transponder 4 of SATCOM FII: CBS Radio Network sports feeds are found on **421** kHz (USB). NBC Radio Network sports feeds are found on **469** kHz (USB). Additional sports feeds from UPI are found on **481** kHz (USB).

While you are researching SATCOM FII at 119 degrees you also might find the video programming of interest. Transponder 8 is leased by NBC for intra-network linking, primarily for west coast feeds to the east coast. Program segments (i.e. the **Prime Time Saturday** program segments from Jack Perkins) originating on the west coast are sent to New York here. Normally color bars are up on transponder 8 when there is no video being fed. Remote (west coast) sporting events, sent to New York for plugging into the terrestrial circuit, are often found here on weekends. If you have **two** satellite receivers to work with, you can often find a special audio circuit on transponder 20, **7381 kHz**, USB on which the remote field producers communicate with network control in New York about the progress of the remote feed.

NEED PARTS...
Sat-tec's Got 'em!



70 MHz DEMODULATOR CARD

The Sat-tec D-1 demodulator is the last block in a TVRO system, it is where the 70 MHz IF signal is converted to video and audio. The D-1 contains a PLL demodulator, video processor (CCIR de-emphasis, 4 MHz low pass filtering and 30 Hz clamp), dual sound sub-carrier demod and AFC circuitry. The power requirement is small, 15 VDC @ 200ma., signal input is -20dbm @ 70 MHz. AFC will enable the user to lock most any VTO L.O. with no problem whatsoever. Video and audio outputs are a standard 1 volt p-p suitable for driving any monitor, VTR, or modulator.

SPECIFICATIONS:
Signal input 70 MHz at 20dbm (22mv)
AFC lock range greater than 5 MHz
Sound subcarriers 6.2 MHz and 6.8 MHz fully independent
Video level out, std. 1 volt p-p
Audio level out 1 volt p-p
Power requirements 15VDC @ 200 ma
Demodulator NE564 PLL IC
Tuning voltage out 2 to 13.5 volts
Tuning voltage in, 0 to 15 volts max

D-1 Demodulator Kit $99.95
D-1 Demodulator PC board only $49.95

Part Number	Description	Price Each
Avantek GPD 1002	1 GHz, 12 db gain TO-8 can amplifier, 15 VDC	$45 00
Watkins Johnson V802	2 5 3 7GHz VTO, lower noise than Avantek types	120 00
Watkins Johnson V705	600-1000 MHz VTO, lower noise than Avantek	120 00
Signetics NE564	PLL selected to operate at 70 MHz	7 50
Van L DBM 500	4GHz mixer, SMA connectors	85 00
Amperex ATF 417	1 GHz, 25db gain hybrid amplifier, 20-24 VDC	19 00
Motorola MWA 110	400 MHz, 14db gain, -2 5 dbm	9 00
Motorola MWA 120	400 MHz, 14db gain, +8dbm	9 75
Motorola MWA 220	600 MHz, 10db gain, +10 5dbm	12 40
Motorola MWA 230	600 MHz, 10db gain, +18 5dbm	13 50
Motorola MWA 310	1 GHz, 8db gain, +3 5dbm	12 40
Motorola MWA 320	1 GHz, 8db gain, +11 5dbm	13 50
Motorola BFR 90	3GHz F_t NPN transistor, 15db gain @ 1 2GHz	2 50
Motorola MRF 901	3GHz F_t NPN like BFR 90 but 2 emiter leads	2 75
Regulators 7800 Series	5V, 8V, 12V, 15V, 1A TO-220	1 50
Regulators 7900 Series	5V, 8V, 12V, 15V, 1A TO-220	1 75
IF Transformer	10 7MHz IF can be padded to 6 2 or 6 8MHz	1 25
Tuning capacitor	10pf multi turn for filters, PLL, etc	95
Coil form + can set	Nice coil form set for filters, good to 120 MHz	2 00

Sat-tec Systems; Box 10101
Rochester, NY 14610; (716)381-7265

3.7-4.2 GHz SUPERVERTER

70 MHz IF, 40 MHz bandwidth with 25 dB gain. 10 dB noise figure, 10 dB (minimum) image rejection. Can mount at antenna with SMA input, 'F' output connectors.

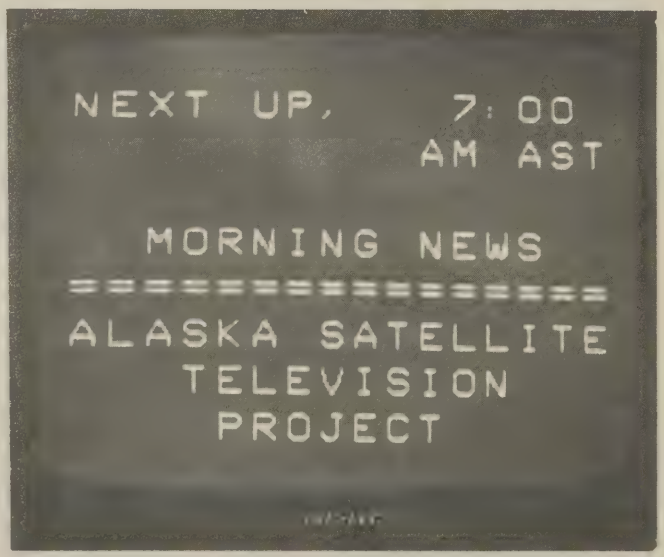
Wired and tested, less power supply,..... $300.
IF Amp (70 MHz center) with 45 dB gain, 30 MHz bandwidth..... $ 80.
TVRO DEMOD (discriminator type) baseband output..... $100.

Terms: Payment with order, delivery 2-6 wks.

GHZ ENGINEERING
P.O.Box 33205 Phoenix, AZ 85067 (602/266-9749)

Transponders 9 and 23 are largely dedicated to Alaskan video. The transponder 9 feed is of particular interest since it is the **'Alaskan Forces Satellite Network'** service that begins feeding tape delayed programming from the mainland US to Alaska around noon central time and continues running (because of the 5 hour time difference between the east coast US and central Alaska) until well into the wee hours of the morning. This 'network' borrows freely from the 'best' of CBS, ABC and NBC along with some syndicated programs making up a full broadcast day for service personnel scattered throughout Alaska. Note the twin-time listings on the promotional slide for 'Last of The Wild'; viewers in the Bering Straights area are six hours removed from the east coast of the USA!

AFSN - Alaskan Forces Satellite Network operates around 16 hours per day on F2 transponder 9 feeding 'network' programs to military personnel scattered throughout Alaska [and elsewhere]. Time in upper right reflects AST and time zone for far-western Bering Straight area. Note programs do not always start on even hour or half-hour points!



ASTP - Alaskan Satellite Television Project uses transponder 23 to send delayed mainland programs and in-school instruction programs to some 60 + 4.5 meter Alaskan 'Bush Terminal' sites.

Transponder 23 is a special service channel for Alaska and it does double duty as a sytem of getting US live network programs **to** Anchorage during the early hours each day, and then after the programs have been received in Anchorage and taped for later replay, the channel is reconfigured as a broadcast channel and programs are sent **back out to** the so-called 'Bush Terminals'. This service is, unlike the AFSN the 'Alaska Satellite Television Project'. Some 60 + receiving sites scattered throughout Alaska are interconnected via satellite and they rebroadcast the satellite fed programming through local low-power VHF television stations (actually 'translators').

If you live in the eastern and central time zone, the primary benefit of transponder 23's Alaskan Satellite Television Projeact is that popular network shows such as the CBS Morning News or Good Morning America are sent from Los Angeles north to Alaska while they are running in the pacific time zone (i.e. after they have left the air in the east an and central zones) so you get an extra shot at the morning news, often while it is almost noon in the east. Then a few hours later you get a third shot at the same programs as they are rebroadcast back into Alaskan Bush Terminals. You can watch 'Good Morning America!' at 12 noon in the east if that fits your schedule. Don't be surprised if there is **no audio** on many of the transponder 23 transmissions however; it is often sent via a separate transponder as an audio - only carrier. Transponder 9 for AFSN however has the standard 6.8 MHz audio sub-carrier.

SMALL SYSTEM APPLICATIONS

LOVE THE CANADIAN SPIRIT!

In the ongoing battle of words (and not much action **to date**), the latest action of a segment of British Columbia provincial government has Canada buzzing.

An (illegal) satellite TV receive dish has been installed atop the BC provincial legislature building. The antenna plus electronics will be used to feed reception of **American** satellite programming to various offices in the building. Dr. Pat McGeer, BC Minister of Communications, says the dish is his provinces's official reaction to the latest warnings from Dr. John Meisel, chairman of the Canadian Radio-Television Commission (CRTC) that he CRTC now intends to ''**...prosecute persons operating illegal earth stations where the evidence and circumstances warrant...**''.

McGeer estimates, through BC government sources, that there are no fewer than 200 (illegal) terminals now operating in British Columbia alone. The BC government is, in effect, challenging the federal Canadian government to a show down and shoot out; to see which side can prevail. The BC folks believe that as long as private individuals in Canada have the dishes plus terminals and they are **not** re-selling the signals to others, they are within the law.

Dr. Meisel and the federal CRTC is caught in a cross-fire. Cable television firms, US program suppliers (such as HBO) and the officials of Telesat (the Canadian satellite operator) are demanding that the federal Canadian government shut down the terminals. During the Canadian Cable Television Association trade show in Vancouver late in May there were

open appeals that the illegal terminals be shut down.

McGeer replied that "**...television signals are essentially radio signals at a much higher frequency. Ottawa does not license radios or tell Canadians what stations they can tune in so it's utterly preposterous to treat television differently**".

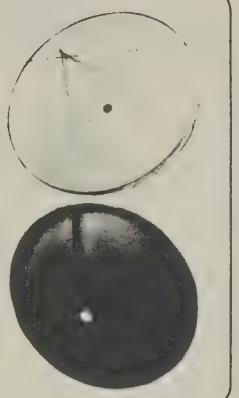
McGeer envisions immediate and hostile reaciton from remote Canadians who are faced with loss of their only television service. "Search and seizure could create a bloodbath" commented an Canadian official "and the first time there is a real incident with somebody getting hurt, the publicity for the government would be almost unbearable".

During the Canadian Cable show an attorney for HBO said his firm was attempting to get the CRTC to act "primarily in those situations where remote Canadian cable operators are receiving HBO service and then re-selling it to whole communities. We are not authorized to sell our programs to Canada, by our program supplier contracts, and our SATCOM satellite is not authorized to serve Canada".

Now available at an affordable price...

PARABOLIC REFLECTOR ANTENNA

Big 10 ft. diameter fiberglass construction with 4 petals and center section. Bolts together easily in 45 minutes. Focal length 48.6, F/D Ratio .4, Gain 39db. Weight 185 lbs.
Reflector only $680.00.
In lots of 10 $585.00.



MINI - CASAT
2207 FORREST ST. TUPELO, MS 38801
601 862-2132 842-8617

GOOD NEWS FOR TVRO DEALERS/ DISTRIBUTORS/ MANUFACTURERS!

Bob Cooper has prepared a custom sales demonstration videotape for you! Running approximately 11 minutes, '**The Satellite TV Story**' captures the excitement and spirit of having satellite TV in your home. Perfect for one-on-one pre-selling, groups, un-attended displays. Color of course, prepared by Coop so that viewers grasp the essentials of a home terminal and how it works. AND - on the same (VHS or BETA) tape is approximately 50 minutes of 'informal Coop' directed to installers and dealers filled with system installation pitfalls and solutions. Excellent for training your people!

This custom videotape is available on BETA or VHS. The price is $60 per copy **but** for an extra $10 we'll 'tag' it with your company name, address and telephone number. Shipment within seven days of receipt of order. If you order the 'tagged' version be sure to specify what the tag is to say, and tell us whether VHS or BETA. **Order STP-1.**

PLUS - The world-famous 'Satellite TV Handbook' (more than 15,000 in print now) which has introduced tens of thousands to home satellite TV (at $7.50 each) is now available **in 50-Handbook-Bundles** for $125 (postage paid within US, Canada). The perfect introductory piece to satellite TV and each copy carries the full $7.50 list price. Sorry - only available in bundles of 50. **Order SEP-1 at $125.**

SAVE EXTRA MONEY by ordering 'Combo-Package' including a 50 bundle of Handbooks **plus** STP-1 videotape. Price is $175 US and Canada or $185 with custom tag on videotape. US funds only. **Order CP-1.**

STT P. O. Box G, Arcadia, OK 73007 405/396-2574

BIRD OPERATIONAL NOTES

Fallout from late-May NCTA cable 'bash' in Dallas still being heard. Likely results: [1] Present cable-only status (or only-cable as you prefer) of RCA SATCOM FI (135 degrees) to be pushed by competition from COMSTAR D2 (which has 11 transponders set aside for Cable's ''Second Network'' and now WESTAR 3; [2] entry of CBS (television network) into area of cable programmer has cable people concerned and competitive networks buzzing, and, [3] fears of mushrooming DBS (Direct Broadcasting Satellites) at proposed 12 GHz band seems to have been toned down with recognition that DBS is already here at 4 GHz. RCA FI will continue to be '**the** programming bird' for period through launch of SATCOM FIII-A (now scheduled fall of 1981) but in interim between 8 and 11 new cable programming services will show up on D2 (95 degrees) and perhaps as many as 5 on WESTAR III (91 degrees). Leading route to Westar 3 is Satellite Syndicated Systems (operator of SPN on TR 21, FI) which decided at NCTA show that it wanted no part of COMSTAR D2 service. CBS had previously announced it too would be there with cable network programming, perhaps as soon as early 1981.

With between 33 and 35 cable programming services scheduled for three separate birds, cable operators seem willing now to talk in positive way about second and even third dish. Private terminal suppliers, such as Vidiark with a spherical antenna that allows the feed rather than the surface to move to change birds, are delighted. However **this** problem with spherical reflectors; WESTAR 3 is at 91 degrees, SATCOM FI is at 135 degrees. Between the two is 44 degrees of space- some 4 to 14 more than existing spherical designs can focus on (limited as they are to 30-40 degree window). Other private terminal suppliers, such as Gene Martin's Satellite Television Systems believe move to multiple cable programming spread over 44 degrees of sky can only make motorized antenna systems more popular.

RF Modulators

Channel 3 or 4

$69.95

Call Toll Free 1-800-624-0851

In WV Call 1-800-325-0761

Or Write

Radio Shack Dealer

P. O. Box 188

Petersburg, WV 26847

How and when all of this new programming will shape up and actually be available remains to be seen; best bets are between September 1 and January 1 an additional six to eight channels will join those already operating; the new ones split between WESTAR III and COMSTAR D2 at first.

FI's video-active transponder group stayed even during June even though Ted Turner's Cable News Network (CNN) made debut on schedule at 6 PM eastern June first (a CNN program schedule in **August** Programming section of **CSD**). Turner's new news service looks good on transponder 14 but Trinity's transponder 13 feed has apparently quit for good. Trinity has been subject to frequent transponder failure for several months; they had purchased 13 on a 'pre-emptible' basis meaning if their transponder quit RCA was under no contractural obligation to find them a new transponder. It did. They didn't. RCA hopes they may be able to fix it but it doesn't look good. Other transponder operators who know RCA **expects** to lose one transponder per year are feeling mixed blessing; it wasn't theirs...but...the next one could be.

COMSAT has formed a new corporate group to regroup their push for 12 GHz DBS System. They now envision 3 satellites with two national channels plus two regional channels; a total of 15 regions in North America. Newest target date (they had originally said 1983) is 1985.

BLAIRSAT (commercials-via-satellite distributor) will start utilizing TR 2 on WESTAR 3 October 1st between 6 and 10 AM eastern to transmit commercials to TV stations in 31 markets. SPN will start simultaneous feeding of SPN programming (TR 21, FI) on WESTAR TR 9 July 18 in preparation for fulltime use of WESTAR 3. CBS will be shooting programming to cable systems on TR 6 of WESTAR 3. SIN is also on WESTAR 3, CNN uses a WESTAR 3 transponder for 'inward bound transmissions' to Atlanta. ABC, Hughes TV network also frequent users of same bird.

New 'Las Vegas based' programming services for cable, 'Las Vegas Entertainment Network' and 'CineAmerica' plan September start on COMSTAR D2 and possibly simultaneously on WESTAR 3. Las Vegas portion will be oriented towards LV shows and events; CineAmerica is special cable network for folks over 50.

Meanwhile the controversial 'Premiere' pay cable (movie) program, (see **CSD** for June, page P9) has announced a January 1981 'launch' and they will be charging cable systems $3.75 per month for 12 hour service which will be on both FI transponder 21 and either transponder 9 on COMSTAR D2 and / or some transponder on WESTAR 3.

PERHAPS - just perhaps the push to scramble **some** of the pay-cable program channels (such as HBO) may be going in opposite direction. Attitude at cable NCTA bash was surprisingly tolerant. Scientific Atlanta has new stance of arguing this is not a big enough deal to warrant investing in industry wide scrambling-descrambling system. SA's John Bacon said ''We should not be held hostage by a relatively small group of hobbyists''.

HBO's new 'maxi' service (now called CINEMAX), to be 24 hour 'action movie-movie oriented, now looks like a September start using transponders 20 and 23.

ESPN now firm on increasing daily broadcast schedule September 1st to 24 hours on transponder 7, FI. Service is already 24 hours on Friday-Saturday-Sunday.

Latest proposal for satellite distributed pay-programming comes from Carnegie Commission. PACE (Performing Arts, Culture and Entertainment) would offer around 200 hours per month including foreign films. No mention of satellite or time frame yet.

DOW JONES reports plus Merrill Lynch financial data will start test via COMSTAR D2 late this summer to cable system near Dallas. Data will be digital requiring special processing before display on CRT.

NOTICE to CSD subscribers: If you should be moving, we **MUST** have the **address label** from your envelope when you notify us of old and new address. If you are contemplating moving, stash the label that came on this month's magazine envelope away. Without it your address change request will be delayed substantially.

ANYWAY YOU LOOK AT IT...

ADM HAS YOUR ANTENNA!

AND YOUR TVRO SYSTEM. Rapid delivery on ADM's super-efficient 11 foot polar mount antenna (includes remote controlled polarization rotation system as well!), plus, packages are available for complete systems including LNA, 24 channel tuneable receiver and cabling. Why wait in a long line when you can get the best, today!

A SUPER TVRO ANTENNA SYSTEM. High quality panelized aluminum 11 foot dish and steel polar mount. Dish weighs approximately 200 pounds, mount 265 pounds. Precision designed, easy installation, zinc chromate base primed and heavy duty white top finish. The rotating feed is standard! Easily shipped and installed. Choice openings for dealers and distributors.

Antenna Development & Manufacturing, Inc.

P.O. Box 1178
Poplar Bluff, Mo. 63901
(1-314-785-5988)

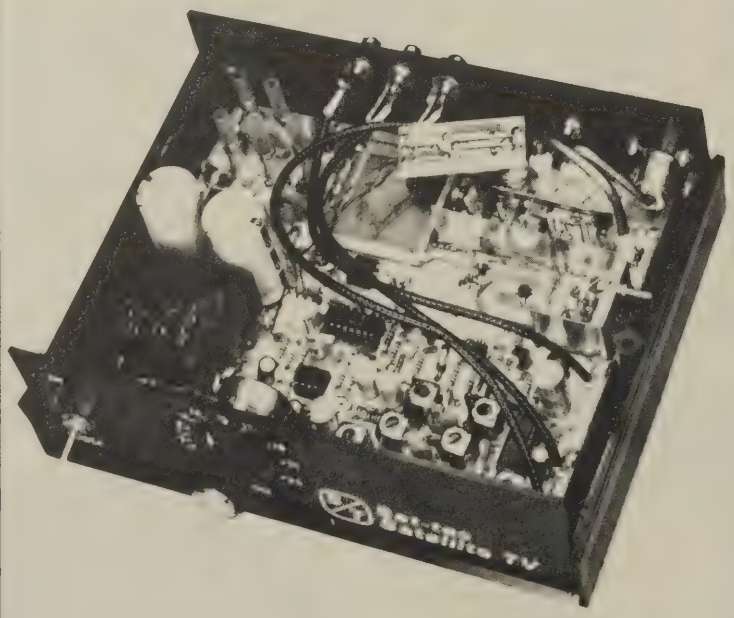
Sat-tec THE LEADER IN LOW COST TVRO

Introducing the R2 Satellite Receiver

A TV Satellite Receiver with all the features you need, at a price you can afford.

The Sat-tec R2 receiver is a versatile, consumer oriented unit designed for volume production. Easy operation and a clear, simple format makes the R2 idea for any application where non-technical users are involved. Fully frequency agile, the R2 may be used on 12 or 24 transponder birds, and since the tuning is continuous, foreign satellites such as Intelsat and Molniya can be received. A high performance AFC keeps the tuning accurate and sharp, fine tuning is not necessary. Standard one-volt P-P outputs for both audio subcarriers as well as video interface easily to any VTR or use the optional BC-1 modulator for direct TV set hook-up.

For a quality, low cost TVRO system, the Sat-tec R2 receiver can't be beat!



SPECIFICATIONS

Frequency Range:	3.5 - 4.5 GHz
Noise Figure:	12 dB, a 120° K 50 dB LNA and 10' dish provides good quality reception for most of USA.
Audio Subcarriers:	6.2 and 6.8 MHz standard, others available.
LNA Power:	15 volt at 150 Ma LNA Supply built-in.
Power Required:	110 VAC at 15 watts 50/60 Hz, 220 volt available.
Size:	8 x 6 x 3 inches, 3 lbs.
Price:	$995.00, completely wired and aligned; one year warranty.
Optional:	BC-1 RF Modulator Kit, tuneable channels 3-6 with sound....$24.95.

Sat-tec Systems

Penfield, NY 14526 • 2575 Baird Rd. • 716-381-7265

INSIDE THIS ISSUE

SPTS '80 SAN JOSE REPORT

* **Umbrella Antenna Unfurls**
* **Solid Launch For Space**
* **Nifty New Products**
* **Molniya Success**

COMMERICIAL PRODUCT RUNDOWN

COOP'S SATELLITE DIGEST

AUGUST 1980

WE DIDN'T STOP WITH GOOD PERFORMANCE....

We went all the way to good looks!

We figure there are **two people** buying each home TVRO system; a **he** (who insists on **good performance**) and a **she** (who wants **good looks**). That's why Satellite Television Systems of Missouri brings to its dealers a high performance package consisting of a .3 f/D 10 foot parabolic antenna (with 24 petals for maximum surface accuracy and highest gain) with a high performance 24 channel frequency agile receiver, 120 degree K LNA, the antenna mount, an RF modulator plus all cables and fittings ready for you - **the dealer** - to install on your customer's foundation and hook up to their TV!STS dealers don't have to chase modulators or funny unknown parts coast-to-coast to put a system on the air; everything comes directly from STS. And it comes in small, man-handable packages because the whole system ships UPS! Moreover, one look at our soft-beige plus chocolate finished dish and even the coldest distaff heart warms to the prospect of 50 + channels of TV. (P.S. **Yes** - STS of Missouri also offers 10 and 13 foot solid fiberglass dish antenna systems and our dealers can buy **any** parts from us; not just complete systems). **Call us today for the full details on joining 'The Good Looking Team' from STS!**

STS OF MISSOURI

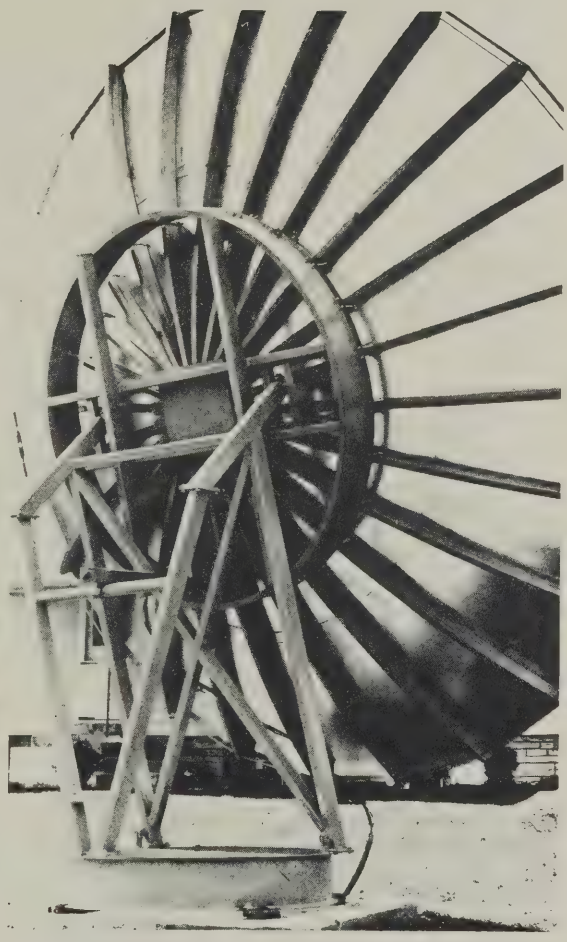
Route #1, Box 132B, Poplar Bluff, MO 63901
Call toll free 1-800-325-0761 outside of Missouri;
inside of Missouri call 1-800-624-0851.

Available Soon

PARAFRAME ANNOUNCES...

The First Remote Control Unit With L-E-D DIGITAL DISPLAY!

And it can be interfaced with your receiver!



THE RCU-24. It's all you'll need in your viewing room besides your TV set. Part of the story: ☐L-E-D DIGITAL transponder display ☐Operable anywhere in your house ☐REAL armchair convenience.

For details contact an authorized PARAFRAME products dealer, some of whom are listed below:

Jerry Peake Company, Inc.
Silver Spring, MD
301-587-2515

John L. Davis
Pocatello, Idaho
208-232-2606

Mid-Continent Earth Stations
Lincoln, Nebraska
402-476-2211

Satellite Systems of Illinois
Steger, IL
312-755-5400

PARAFRAME antennas are adjusted **on site** to conform to the Paraframe Proofing Template. That is how you can guarantee your customers **maximum real world gain**. To learn how to become a protected PARAFRAME Products Dealer, contact:

Bob Christofanelli
Satellite Systems of Illinois
P. O. Box 68
Steger, IL 60475
(312-755-5400)

PARAFRAME

P. O. Box 423
Monee, Illinois 60449
312-534-7435

COOP'S COMMENT ON TECHNOLOGY

AFTER SAN JOSE

Much of this issue of **CSD** reports on the events that shaped the San Jose SPTS. We all learned a great deal; far too much to relate in a single issue. Everything worked superbly with the possible exception of a minor San Jose (wide) power glitch Sunday morning that chopped us 'off-the-air' about five minutes into our every-morning 'Today At SPTS' live TV report. Pity. We had some great guests lined up!

This industry came of age in San Jose. The 32 booth displays showed surprising maturity and a handful even grew out of the 'table top display' era into self-contained booths. There were 22 operating TVRO antennas there; from the six foot '8 Ball Camper Special' to some very impressive motor driven 16 footers with digital displays of azimuth, elevation, transponder selection and feed horn orientation. Molniya dropped in on schedule on an 11 foot ADM antenna and the Russians seemed to cooperate Saturday evening when they scheduled a special 'expose' of the American CIA 'covert activities' against the USSR. Dozens of us sat around as CIA documents stamped 'top secret' and 'security clearance required' filled the screen with Russian video depicting tons of contraband seized (they said) at Russian border staitons. One chap commented 'Our US Senators need to watch this program...**then** they would know what the cold war is all about!'. Some of the more amusing contraband displayed included copies of PLAYBOY, Levi Jeans and various feminine hygiene products. Each time the Russian program cut back to the CIA documents and they zoomed in on a particular line or paragraph (in English of course since this was purported to be a genuine item) a hush fell over the crowd assembled around the 9 inch monitor as we strained to read the document. Two attendees who spoke Russian told us what the Russian announcer was saying or the screen supers said as we read for ourselves what the English said. Fascinating!

Officially Stephen Gibson of Los Angeles was the second (after our STT effort) to catch Molniya with the 8-Ball antenna's Hayden McCullough close behind from Arkansas. After SPTS we heard from several more who rushed home to tune in Moscow. Tay Howard got his 15 footer aimed at Molniya in short order after commenting to me at San Jose "I'll look, but I don't think I'll watch it". That was before he found it and called me three times in one day to exchange excited observations. "I admit it, watching Molniya is infectious" he noted. "I'm just excited!". He was. He also modified the popular Chaparral feed to copy the right hand circular signal from Molniya; we hope to tell you how he did it in September.

The weekend following San Jose, just as Susan and I were catching our breath, Steve and Carole Birkill from Sheffield, England dropped in for an overnight stop.They were in the states where Steve was consulting for a US firm that plans to open a sales office in Cairo (Egypt, not Illinois) to peddle high dollar personal terminals to wealthy middle eastern folks. We spent some time looking at Molniya, hooking up a new Pulse Width Modulation detector Steve built recently and generally exchanging notes. We'll have some exciting news about a new Atlantic Ocean region international satellite that places a 31 dBw signal over the eastern third of the US in the September **CSD**; courtesy of Steve. This one has as many as 5 TV channels operational and uses a standard 7.5 MHz audio sub-carrier... but you will have to wait until September to learn more!

The hardware in San Jose was fantastic; but with limited exceptions still not generally available in quantity. I was disappointed that the new production version of the Tay Howard receiver did not make it to San Jose, equally disappointed that John Rohner's LNA + receiver for $1500 was not quite operational. A new firm shipping out of Honolulu called SATRX however had a neat receiver on hand which they are shipping in 100 receiver per month quantities now and some of the advanced prototypes from other firms looked very promising.

We will remember San Jose as the seminar where the bottom fell out of the LNA pricing. $795 for a single 120 degree K, 50 dB gain Avantek and if you and a few friends bought ten, knock off another $125 or so. I don't see this being a temporary price decrease but rather a permanent drop. They'll get down to $500 yet! (And I remember Avantek telling us in Miami that they didn't see pricing dropping below $1000 for several years!!!)

The single most exciting technology item at San Jose had to be Robert Luly's "Umbrella Antenna"; featured on our front cover this month. Can you imagine a 12 pound ten foot antenna that folds up into a package about 6 feet long by 9 inches wide and high? Or a 15 foot of the same design that weighs 15 pounds? We got Luly to show us a private demonstration of his wonder July 4th and then we broke the antenna to the attendees in our Saturday morning 'Today At SPTS' TV show. Luly was mobbed Saturday and well he might have been at $495 single lot pricing for the 10 foot ($750 for the 15 footer). I don't know what others are doing but I am packaging his 15 footer with a Sat-Tec receiver I have built into a Sony 8 inch battery operated color TV. I plan to spend September flying about the Caribbean putting on 'airport satellite TV shows'. A fellow can hit the ground and be showing off satellite TV in ten minutes time, all on the battery power, with a package you can carry under your arm in a two-seater airplane thanks to Luly's creative genius.

Boy was San Jose neat. I can't wait for the next SPTS!

COOP'S SATELLITE DIGEST (Technology Section) is published monthly by Robert B. and Susan T. Cooper doing business as Satellite Television Technology (Ltd.), P.O. Box G, Arcadia, OK 73007 (USA); 405-396-2574. **CSD** is not affiliated with any satellite programming distributor, hardware (equipment) manufacturer or distributor nor satellite systems operator. STT sponsors the Satellite Private Terminal Seminars (SPTS) held three times per year and does produce and distribute 'learning' materials and 'how-to-do-it' manuals relating to the development of the low-cost satellite TV receiving system industry. Subscription fee is $50 (US funds) in advance Canada, US, Mexico; $75 (US funds) elsewhere. Copyright 1980 by Robert B. and Susan T. Cooper.

WHO HAD WHAT AT SAN JOSE?

SUSAN COOPER - welcomes the San Jose group to STT's third seminar in a year. In the office she often wears roller skates!

SAN JOSE EXHIBITOR REPORT

A record number of equipment exhibitors were on hand at SPTS '80 San Jose and each offered new innovations in either hardware or pricing not seen at prior SPTS events. When you consider that the first SPTS, one year ago this month, attracted only 8 real exhibitors, the growth within the industry has been phenominal indeed. It is also important to note that several of the San Jose exhibitors attended either the Oklahoma SPTS or the Miami SPTS as **attendees**; saw what was available, and then returned home to create their own products for sale in this young industry. Nor is the innovation over; several people attending the San Jose gathering told us privately that they would be on hand at the **next** Seminar with new products of their own.

CHUCK COLBY - making adjustments on the Microwave General extremely well equipped 16 footer trailer mounted system.

Because of the intense interest in the products and services offered, here is a run down of each exhibit along with information that will help you contact the firms for further information if you were not on hand yourself in San Jose.

Booth #1 - DEXCEL, Inc. (2285-C Martin Avenue, Santa Clara, CA 95050) brought a series of 30 and 50 dB gain low noise amplifiers along with GaAs-FET devices which the home builder can incorporate into his own LNA design. DEXCEL's posture of providing GaAs-FET devices and builder assistance is unique in this field for a GaAs-FET supplier and you can find out more from Art Kawai (408-727-9833).

Booth #2 - AVCOM of Virginia, Inc. (10139 Apache Rd., Richmond, VA 23235) had two new versions of their PSR series receivers to display. The COM-3R has switch selectable tuning, AFC, remote control capability (i.e. change transponders from a remote point), and a most attractive new black and silver housing. The COM-3R adds a 24 channel remote control capability with remote antenna polarization switching. The original PSR-3 receiver continues to be available. AVCOM has also added a line of pre-installed connector equipped coaxial down lines in the 80 and 40 foot lengths. The number of antenna firms utilizing the original PSR-3 receiver in their booths speaks well for the industry's acceptance of the Hatfield product. In tests conducted on the Russian Molniya-3 reception, the PSR-3 receiver displayed the best overall picture quality against two other receivers tested. Contact Andy Hatfield at (804)320-4439.

Booth #3 - Microwave General Corp. (2680 Bayshore Frontage Rd., Mountain View, CA 94043) has been selling 10 foot and larger high quality earth station packages for about one year on the west coast. Chuck Colby has expanded the firm's product line to now include a wide

WILLING HANDS - McCullough had plenty of help in getting his 12 footer re-created and assembled at poolside.

8-BALL FRAMING COMPLETED - now the screening is applied.

variety of feeds (from simple horns to scalar loaded ortho-mode or dual polarization), antennas from 10 feet to 16.6 feet and a fascinating selection of low profile antenna mounting systems and digital display antenna position indicators. Colby's approach is to build the best hardware technology knows how to build and to package it so that it is simplistic to use for the layman and even environmentally pleasing (he offers his antennas in sand-brown and leaf-green so they blend into the surroundings!). More information from (415)969-3355.

Booth #4 - Vidiark Electronics Development Co. (P. O. Box 57, Salem, Arkansas 72576) brought the '8 Ball Antenna' system to San Jose. Setting up at the eastern edge of the Hyatt pool deck McCullough and Canada's David Brough proceeded to dazzle the non-believers with watchable (although not perfect) pictures from a six (6!) foot 8-Ball. The parts for the 8-Ball antennas got mis-placed someplace between Arkansas and California and McCullough was forced to improvise with materials from a local lumber yard to get a 12 footer up and running. The six footer was intended more as a novelty but so

TRANQUIL SCENE - The sun, the pool and satellite antennas. It all seemed to blend together for four days.

RAISE IT UP - 12 foot 8-Ball is pushed upright by a contingent of volunteers.

ONE LAST TACK - and the 12 foot 8-Ball is ready to start receiving pictures.

many people showed serious interest that McCullough decided to make a product out of it calling it (in a moment of inspiration) 'The Camper Special'. Canadian Brough has installed quite a number of these spherical antennas in northern Canada and in one test against a Telesat (Canada) 12 foot parabolic found the side by side pictures identical on both antennas; something that probably didn't make Telesat too happy since they had $20,000 in their super-deluxe 12 foot installation! You can find out more from Hayden McCullough at (501)895-3167.

Booth #5 - Chaparral Communications (P. O. Box 832, Los Altos, CA 94022) brought both their Tay Howard designed scalar loaded feeds and their sectionalized knocked down parabolic dish and mount to San Jose. The feeds went well (nearly 100 sold and delivered on the spot) and the antenna was installed to provide a signal feed for the

THERE IT IS - David Brough gestures to reception from the hastily assembled 12 foot 8-Ball antenna after he and Hayden McCullough directed the task of creating an 8-Ball from locally acquired parts and materials.

CHAPARRAL panelized dish fed signal to the SATRX suite.

COOP [left] - introduces Taylor Howard [center] and John Ramsey [right] during a San Jose session entitled 'Mass Production Receiver Techniques'.

SATRX (suite 302) receiver. Designer Bob Taggart is a very clever fellow with mechanical designs and packaging and we expect he will be bringing out more innovative products in the future. His feed works better (see report in the July **CSD**) than a standard horn but we heard some grumbling from other would-be feed designers that suggests to us that we haven't heard the last word in feed innovations yet. Contact Taggart at (415)941-1555.

Booth #6 - ICON Electronics (333 McPhillips Street, Winnipeg, Manitoba R3E 2K9) brought down a two-receivers in a single cabinet system plus a 96 degree Kelvin LNA designed and built in Canada. The receivers tune all 24 channels and share a common power supply and metering. A built-in power divider allows you to plug in a single antenna downline run plus there is a 4 GHz looped output to drive additional receivers. LNA powering (16 VDC) is built-in. The Spaceamp LNA has 40 dB of gain, covers 3.7 to 4.2 GHz (as it should) and comes out in a standard CPR229G flange to which you bolt your feed antenna. Having product manufactured in Canada will be good for the Canadians who to now have had to fight the border crossing battles but as we shall see ICON was not the only Canadian firm on hand in San Jose. Details from (204)284-1703.

Booth #7 - Hubbard-Payne (aka Hubbard Telephone Contractors, Inc.; Suite 113, 4811 Clinton Hwy, Knoxville, TN 37912) brought a 14 foot antenna system that looked like it climbed right out of Star Wars. Ralph Payne has been working on this very neat package for some time and we think he has a winner here. Payne had one of the most professional booths and products at the show and he seemed to have his marketing program together; by the second day there were plenty of people wandering around wearing Hubbard-Payne T shirts! The 14 foot size is just about right for the southeastern US. For more details contact Ralph Payne at (615)688-6281.

Booth #12 - Comm-Plus (Nelson Ethier; 3680 Cote Vertu, St-Laurent, Quebec H4R 1P8) brought a long list of first-time-seen Canadian created TVRO products to San Jose. The most intriguing was their Teknimat 692A TVRO receiver. It features a servo-lock digital pushbutton tuning with auto scan. You push the scan activate button and the receiver climbs through all of the transponders with a digital display of the one you are looking at. There is even a clever vertical and horizontal polarization indicator. The TVRO signal is processed with a digital circuit and the demodulator gets away from the 564 PLL with a passive approach. Audio on 6.2 or 6.8 is built-in and there are a pair of large, illuminated meters to give you center tuning and signal strength readings. The housing has an anodized front panel with a wood verneer cabinet and the unit looks more like a space age stereo tuner than a TVRO receiver. We expected it to be the most expensive receiver at San Jose; it wasn't, and that surprised us. Comm-Plus also had a series of antenna feed horns (standard horns starting at $49.50), a polar antenna mount and they offered molds for the Nelson TVRO Parabolic Antenna Manual described 10 and 12 foot antennas. We were impressed with the people associated with this Montreal outfit and they could go far. For more information, contact them at (514)337-7255.

HUBBARD-PAYNE's ESA-14 dish gets a final tweek from Ralph Payne [on ladder].

ANTENNAS-ANTENNAS-ANTENNAS. Left to right, Satellite Television Systems [edge only], Lindsay, MA/Prodelin and Microwave General.

Booth #13 - Lindsay Specialty Products Ltd. (50 Mary Street W., Lindsay, Ontario) first diaplayed a TVRO antenna at Miami. Their latest version is more than a generation better; it was superb. They offer a 13 footer that ships in panels and based upon some non-professional and therefore hardly 'sanitary' tests at San Jose they have a feed that will give the Chaparral a run for its money. Lindsay's John Thomas has been building antennas for (it seems) decades and he is a tough, shrewd businessman who doesn't give up easily. His present product is rugged, looks great, and performs well. The mount however could still use some work. Lindsay has turned out (literally) millions of home and CATV antennas through the years; they'll be a force to be reckoned with.

Booth #14 - Ramsey Electronics (P. O. Box 10101, Rochester, N.Y. 14610) brought their new Sat-Tec receiver plus modules and parts for the home builder. The Sat-Tec receiver like the AVCOM was widely utilized by the antenna folks to display their reception. In fact David Brough had a Sat-Tec in the 8-Ball display which he had modified with a remote control equipped with digital readout. Our initial review of the Sat-Tec receiver in the July **CSD** now gets this addendum: on the Russian Molniya reception we were experiencing baseband (or high frequency) noise after we had built the 4 GHz signal up to the point that we had no sparklies. When we went to add a Birkill PWM decoder for the audio we found we had high noise levels that covered the PWM pulses. We eventually traced the problem to a very tilted response in the Sat-Tec receiver's video amplifiers; with the chroma running 8-10 dB higher (by reference) than it should have been. We also found a damped oscillation occurring around 4.5 MHz or so. **None of this affected the apparent quality of the DOMSAT video signals** but when you connected a scope to the video output while tuned to a color bar signal there was a very strange display that certainly did not look like a color bar; the signal to the scope was largely chroma and very little low frequency (sync) information. Our test receiver has gone back to Sat-Tec at this writing to get the problem fixed. Had we not been chasing Molniya and wanted the PWM signal we probably would have gone merrily along never aware of the problem. That addendum aside, Ramsey appeared in San Jose with around two dozen of the little receivers and they quickly were snapped up. During a panel discussion on receiver mass production Ramsey suggested that a monthly production run of around 100 receivers was probably realistic from this point forward. For more infformation call Ramsey / Sat-Tec at (716)381-7265.

Booth #15 - Sat-Tec (see booth number 14).

Booth #16 - Satellite Supplies (Box 278, Aldergrove, B.C. VOX 1AO) were on hand to show off the commercial models of the Taylor Howard receiver. Unfortunately they were short by perhaps two weeks of having the units in full production and ready to show. That didn't keep them from talking the unit up and acting like they would be shipping 100+ receivers per month about the time you read this (or by September if not in August) and you can **now** telephone Peter Cook or J. R. Walsh at (604)859-6315.

Booth #17 - VITALINK (701 Welch Road, #225, Palo Alto, California 94304) was to show off 12 GHz gear. It appears the firm is in the midst of some type of major product change and if you are able to figure out where they are going and with what, you might let us know! Their telephone number is (415)328-9972.

Booth #18 - SATELCO (5540 W. Pico Blvd, Los Angeles, CA 90019) continues to concentrate on offering special hardware

MULTI-WORLDS SERVICE - live and direct from Asia, North and South America it all came together at the San Jose Hyatt.

Alaska Microwave Labs

4335 E. 5TH STREET ANCHORAGE, ALASKA 99504
(907) 338-0340

TRANSISTORS

MRF901 FT4 5GHZ	$ 3.25
BFR90 FT5 0GHZ	$ 3.00
NEC 02137 FT4 5GHZ	$ 3.25

HOT CARRIER DIODES

MBD101 UHF—MICROWAVE	$ 1.50
ND4131 4GHZ NF—5.75 DB	$13.25
4GHZ NF— 6.5 DB	$ 2.00

CHIP CAPACITORS

10( )47( )100( )1000( ) Pf	$ .60

RF - IF I.C. AMP

MWA—110 RF—IF AMPLIFIER I.C. 1 TO 400 MC 14 DB GAIN TYP 3 TERMINAL IN, OUT, & GROUND	$ 7.95

DUAL GATE MOSFET

RCA 40673	$ 1.50

COAX CONNECTORS

BNC CHASSIS MOUNT SQUARE FLANGE	$ 1.87
BNC PLUG FOR RG—58	$ 1.87
SMA CHASSIS MOUNT SQUARE FLANGE	$ 5.90
SMA PLUG FOR RG—58	$ 6.57
SMA PLUG FOR RG—174	$ 6.57
TYPE N CHASSIS MOUNT SQUARE FLANGE	$ 3.20
TYPE N PLUG FOR RG—9/RG—8	$ 3.69

FEED-THRU CAPACITORS

500 Pf	$ .50

TEFLON CIRCUIT BOARD

APPROX. 3.5" x 5.0" x .010	$ 5.50
APPROX. 3.5" x 5.0" x .0312	$ 6.50

CHIP RESISTORS

50 OHM WATT	$ 1.50

PISTON TRIMMERS

Triko 201—01M. 5—3Pf( )1—8Pf( )	$ 2.50

OPEN AT 8PM EST CLOSED 8PM PST

ORDERS ARE POSTAGE PAID
COD—VISA—MASTERCHARGE

IF YOU DO NOT SEE
WHAT YOU WANT ASK

LOW NOISE AMPLIFIERS
MAJOR BRANDS-Low Prices-Write!

3.7 — 4.2 GHz DOWNCONVERTER

- 3.7 70 MHz out
- P rol tuning
- able
- $895.

Polar M d Rotation

SUP d

THIS PRODUCT NO LONGER AVAILABLE

- Teflon PC Board dieled x9'' x4'' $14.00
- Chip capacitor kit 12 each, 470 pf...only $18.00
- SMA and Type N connectors
- .141'' Semi-rigid coax $3.45 per foot
- 2'' x14'' copper tube for Birkill feed. $12.00

SATELLITE INNOVATIONS
P. O. Box 5673, Winston Salem, NC 27103

Add $2.00 shipping and handling.

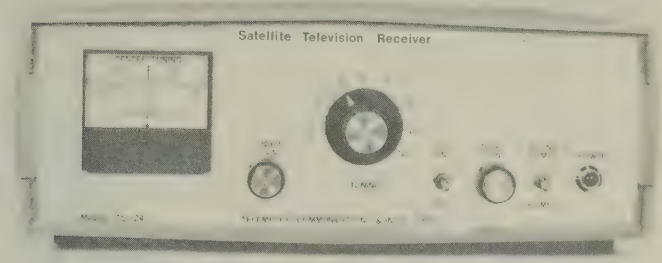
packages to off-shore buyers. As best we can determine, they are dealing in customized antenna, LNA and receiver packages intended for use in the middle east, Africa, South America and the Pacific. They have a history of handling electronics hardware for export and they seem to be following the same procedures for TVRO installations. You can call Sam Kleinman about all of this at (213)931-6274.

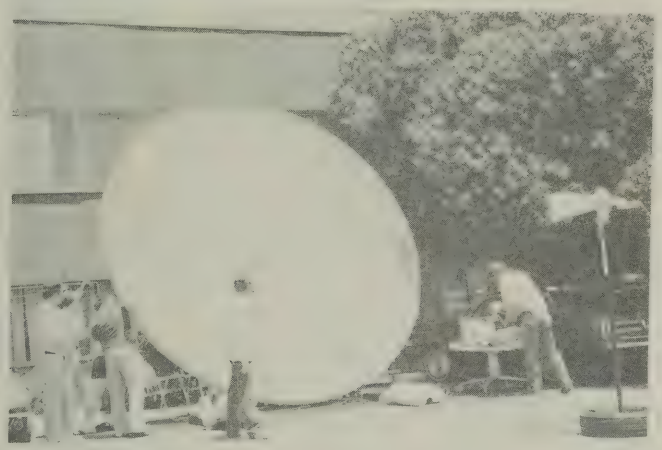
Booth #19 - AMPLICA, Inc. (950 Lawrence Drive, Newbury, Park, CA 91320) brought their high quality LNA line to San Jose and dazzled us with a fish tank that had an LNA operating **underwater**. Naturally you probably won't install yours there but it is nice to know that in case you get a lot of rain in your area your LNA won't quit working even if your antenna goes below the waterline! They had a very professional crew that knew what LNAs are all about. It appeared that they were caught somewhat by surprise by the AVANTEK LNA price drop but we suspect they'll stay competitive none the less. You can learn more by contacting Jim Cole.

AMPLICA LNAs - a booth full of exotic hardware ready to go home with the buyer and pop onto an antenna.

Booth #20 - Howard/Coleman Circuit Boards (RFD 3, Box 58-A, Travelers Rest, S.C. 29690) had a busy booth through much of the show. Robert and Lib Coleman and Annie Howard displayed raw boards, boards with parts stuffed and a customized receiver built by Californian Lance Ginner using the boards designed by Tay Howard and Robert Coleman and manufactured by Coleman in SC. We heard one fellow saying that the boards plus the instructions made it possible for him to build his own receiver; he was uncertain of his own capabilities to duplicate the straight Howard receiver from the Howard Manual and when the boards became available that gave him the confidence and direction he needed to do it on his own. Lots of people apparently feel the same way and for the builder this remains one of the best ways to go. More information from Bob Coleman at (803)834-9030.

Booth #21 - Telemetry Communications & Instrumentation Corp. / Swan Antennas (411 N. Buchanan Cr., #3, Pacheco, CA 94553) brought together the original Swan Antenna plus a new receiver designed by C. E. Green of TCI. It was good to see the Swan family (Oliver's brother Henry and his son Alan) back into operation with an antenna product that has all of Oliver's original magic plus a very professional construction and assembly approach. Green's TCI has an interesting dual conversion receiver that is extremely handsome (packaged something like the main portion of the Washburn receiver) with lots of built-in features. Included is a video gain control, an AFC on-off control, audio gain control and switch selectable 6.8 and 6.2 MHz. The RF output is on VHF channels 3 and 4 at a very healthy 350 mV which can directly drive several thousand feet of RG-59 or 11 cable without additional amplifiers. They also have a 70 MHz IF output jack (plus rear apron twin video output jacks and an audio output





SWAN SPHERICAL - the original, manufactured by Henry and Alan Swan teamed up with TCI's C. E. Green to package a system providing high quality reception with multiple-satellite visibility.

jack in addition to the VHF channel 3 or 4) which is very handy for plugging in a CATV field strength meter or wideband scope or spectrum analyzer. It is a high quality receiver product priced under $2,000. For more information contact them at (415)676-6102.

Booth #22 - AVANTEK, Inc. (3175 Bowers Avenue, Santa Clara, CA 95051) brought their LNAs plus their devices such as the VTO 8360s. This was another well laid out, professional booth that was on hand to do business. Most of the discussion on LNA pricing was heard away from the booth but we did learn that if you are a distributor and can manage to order say 100 of the units you can expect to pay around $550 for them; or if you can order ten at a time the price will be closer to $675 (give or take a few dollars).This then explains that $795 single lot retail prices you now see popping up in **CSD** and elsewhere. There was much speculation about whether this price drop for a 120 degree K LNA, 50 dB gain with a DC power block (to allow you to feed your DC operating voltage back up your 4 GHz downline) was temporary or not. The Seminar was ripe with rumors that the price drop was temporary because of an over stock of LNAs; we could not substantiate that rumor. You can do your own checking by calling Jim Lindauer at (408)727-0700.

Booth #23 - ICM / International Crystal Manufacturing Co., Inc. (10 North Lee, Oklahoma City, OK 73102) brought along a surprise. Their now well established TVM-4200 receiver had a new companion in San Jose; the TVM-4300 which had a large sign on the booth that proclaimed it to be priced at $995 in single lot quantities. The 4300 is fully tuneable, dual audio outputs (6.2 or 6.8), built-in LNA power supply, built-in AFC (plus manual fine tuning), and a set of baseband audio / video outputs to drive an external modulator or loop through your VTR to use that modulator. A plug in remote control is also available ($99.50) as are non-standard audio demodulator frequencies including a stereo audio demodulator package ($89.50) for the aural services now popping up on odd-ball sub-carriers. The model TV-4300A has the remote control

ICM'S NEW TV-4300 - the latest satellite TV receiver from International Crystal features 24 channel tuning, optional remote control package and stereo decoder system for sub-carrier stereo channels.

plus the selectable audio options available for $1149 in single lots. Paul Shuch was on hand to explain the inner workings of the receiver and this one was first seen in Miami as a Shuch prototype. For more information, contact Royden Freeland at (405)236-3741.

Booth #24 - Rohner & Associates (501 N. Elm Street, West Liberty, Iowa 52776) had hoped to have three of their new digitally operated combo LNA plus receivers on hand in San Jose, operating. Alas, the single unit on display was not operational but John Rohner said they missed it by only a matter of days. Rohner's booth provided no-charge computer derived antenna pointing charts for anyone that remembered their geographic coordinates and **CSD** author Norman Gillaspie (June and Sept.) moved in with his circuit boards for single conversion receiver front ends and his new NEC powered LNA which it turned out John Rohner was also utilizing. In spite of the (non) operational status of the Rohner Converting Video Receiver, the booth was always busy with people who wanted to talk shop (John is one of the most open individuals in the field; he'll gladly share with you anything he is doing!) and his contributions to this young industry in the years ahead may well prove to be substantial. Their sub-carrier and biasing boards were of course on hand. You can find out more by calling John Rohner at (319)627-4819.

Booth #25 - Wagner Industries (P. O. Box 559, Alva, Oklahoma 73717) brought a line of Spherical TVRO antennas out at San Jose. We are not sure just what the acceptance of their product may be and suggest you talk with David Wagner directly as they played it pretty low key in San Jose. Call them at (405)327-1877.

Booth #26 - Washburn Receiver (Clyde Washburn, 195 Thayer Road, Fairport, N.Y. 14550). Clyde brought along the latest version of his receiver, one he says he is **totally happy with**. We can tell you this, there were no better pictures on any receivers at San Jose! Clyde has (as you might have heard or surmised) terminated his previous arrangement to have his receiver produced commercially, or in kit form, with Ramsey Electronics and substitute arrangements were not complete by San Jose. At the moment Clyde is helping anyone who needs assistance in getting their own Washburn designed receiver up and running, but he is **not** in the kit, parts or completed unit business at this writing. However, he is trying to resolve the problem and we can report that there was a brisk business in his manuals at San Jose in spite of the uncertain status of the receiver in kit or commercial form. We hope he gets it into regular production soon because we still believe this receiver has low-signal level operational features still not found in even the best (and most expensive) 'commercial' receivers around.

Booth #30 - Star / Satellite Television Systems (P. O. Box 51837, Lafayette, LA 70505) had a very fine looking and performing 13 foot dish with a polar mount that really **did** track through the full satellite belt with a minimum of

The 8-BALL

12-FOOT SPHERICAL

SATELLITE TELEVISION ANTENNA KIT

LIST PRICE: $750.00

- *Rugged steel frame*
- *Aluminum screen reflector surface*
- *Durable redwood strips support reflector screen*
- *Easy to assemble*
- *Easy to align*
- *Receive signals from several satellites*
- *Very low cost*

VIDIARK ELECTRONICS DEVELOPMENT CO.
P. O. Box 57
Salem, Arkansas 72576
Phone: 501-895-3167

AVANTEK IN STOCK

MODEL 4205 LOW NOISE AMPLIFIER (LNA)
- 50 dB GAIN — 3.7-4.2 GHz
- 1.5 dB MAX NOISE FIGURE (120°K)
- DC POWERED UP CENTER COAX CONDUCTOR

PRICE **$1100.00**

MODEL DCB-42 OPTIONAL DC BLOCK
- DC VOLTAGE BLOCK AT RECEIVER END

PRICE **$50.00**

MODEL VTO-8060 VARACTOR TUNED OSCILLATOR
- 600-1000 MHz FREQ. RANGE
- 3-40 VDC TUNING VOLTAGE PRICE **$150.00**

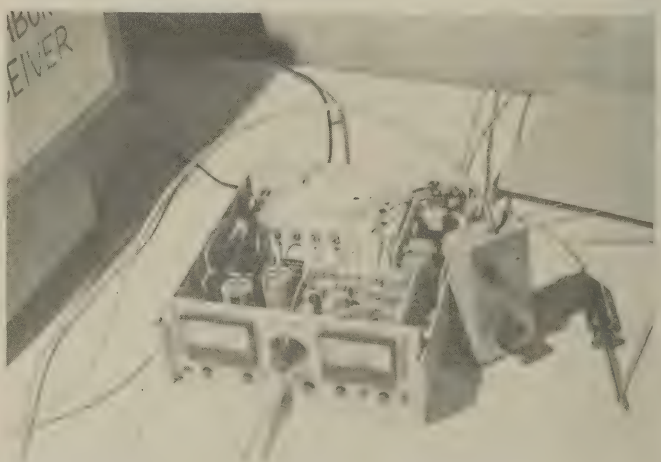
DELSTAR SYSTEMS
DISTRIBUTORS OF EARTH SATELLITE SYSTEMS/EQUIPMENT
9630 Clarewood Suite A-5 • Houston, Tx. 77036 • 713/776-0542

tracking error. There is a raging argument these days as to whether **any** polar mount can track from FI (135 degrees west) to D3 (87 degrees west) without falling 'out' of the Clarke orbit belt. Those who say it cannot be done with adequate precision to follow the satellite belt should see the Star mount work. There have been some organizational changes at Star recently and you may find yourself talking to a new name or two when you contact them. We were assured it is business as usual and we hope so since they have a fine product that deserves a shot at the industry. You can learn more by calling them at (318)234-2495.

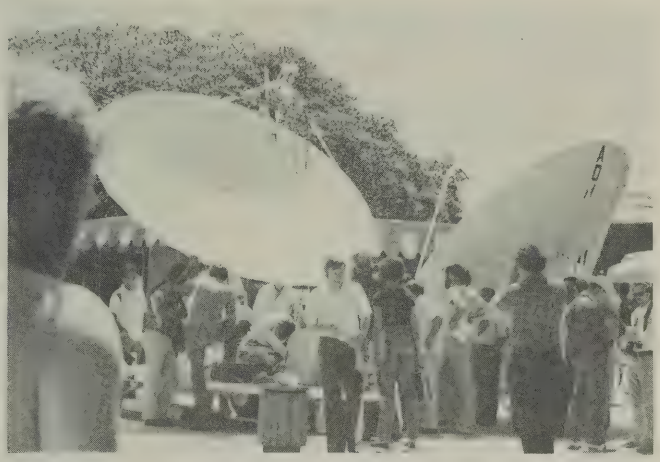
Booth #31 - ADM / Antenna Design & Manufacturing Co. (P. O. Box 1178, Poplar Bluff, MO 63901) brought a pair of antennas to San Jose; one they pointed at the regular Clarke orbit belt and at our request the second was used for the Molniya search operation. We asked them to dedicate one antenna to Molniya since we have been utilizing an ADM antenna here in

NORM GRIFFITH - puts the final bolt into the STAR 13 foot polar mounted system; remote controlled from the viewing spot.

Oklahoma on our own Molniya experiments; and we simply felt more comfortable setting up poolside in San Jose using the same antenna we use in Oklahoma. Jamie and Linda Gowen are fine people, perhaps as nice as anyone in this young business and after we zeroed in on Molniya Jamie told us he was heading right back to Missouri to do the same thing. Their latest antenna is slightly different than our nearly year old



WASHBURN's receiver - present and operational offered builders an opportunity to see one all put together [and operating].



WRONG WAY ANTENNA - closer ADM 11 footer pointing at Molniya gave everyone an opportunity to see what Russian television looks like.

'MAD-MAN' MUNTZ - came to San Jose, is now dealing in 6-10 terminals per month largely in Southern California, and our camera caught Tay Howard near Muntz's van. Will Muntz come out with a $295 home terminal? Stay tuned!!!

model and it goes together easier than ours did. These are good solid people with a good, solid product and the industry is better for their being involved. Jamie still expects to bring out a 13 footer as soon as he gets caught up. You can reach them at (314)234-2495.

Suite #302 - SATRX (250 Kawaihae St., Mt. Terrace, Suite 8A. Honolulu, HA 96825) was a bit of a surprise since they didn't have any advance publicity to prepare us for their receiver. Priced in the $1250 region we were impressed with both the performance and the construction. Barney Phillips who heads up the firm seems to have both feet planted squarely on the ground and he insists that he'll get along on a production run of 100 radios per month or so for the balance of the year until he is convinced the marketplace is really big enough to justify jumping into

THEY ARE SPEAKING RUSSIAN! Navigator Gibson strains an ear to hear Russian audio from the Molniya reception test.

PROUD H. PAUL - stacking his TVM-4300 receiver up against the Sat-Tec unit on Molniya reception (partially visible on screen) Shuch was satisfied his newest creation was capable of Russian standard s reception.

MOTORIZED POLAR MOUNT - from H & R / Starview carries $995 price tag; it ships on a pallet.

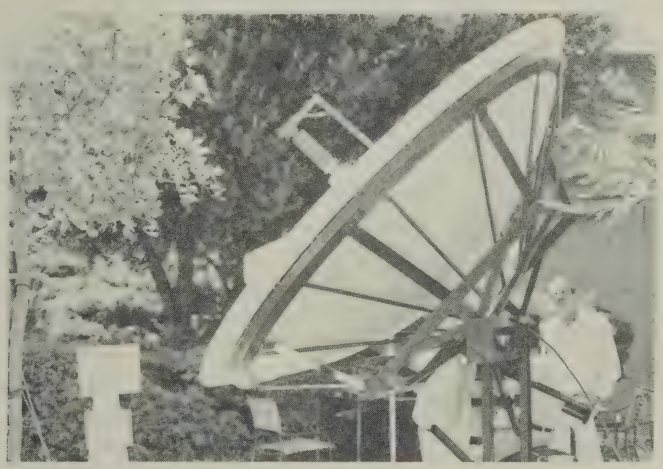
the hundreds or thousands per month class. We were fortunate enough to get a peek inside the receiver and could see that somebody has done an excellent job of designing it so that it could be produced in big quantities. It has a hand held wire remote control, tunes all 24 channels and should be a big seller. You can talk with Barney at (808)377-6195; remember he is in Honolulu and he is still sound asleep when it is 9 AM on the east coast!

FOR THE RECORD - Cooper [center] doing a videotape interview with Paul Shuch [right] and ICM's Royden Freeland [behind Shuch] for running on the next day's "Today At SPTS" TV show run daily at 8 AM.

ASSEMBLING A DISH - hundreds of man hours went into assembly of antennas for SPTS; here crew for MA/COM [Prodelin] completes assembly on 10 footer.

Suite #402 - Microwave Associates Communications Co. (Firm Caller 535, Burlington, MA 01803) brought a ten foot antenna manufactured by a recently acquired MA/COM affiliate firm (Prodelin) and a very professional staff of engineers and sales people. They were in San Jose to 'test' the waters for establishing a network of dealers for their high quality CATV/broadcast commercial gear (plus their Prodelin antennas). The Prodelin 10 foot antenna is probably the neatest (as in most professional) ten foot package available these days but it is not inexpensive. Their VR3 and VR4X receivers are standards of comparison in the 'professional' CATV world and if they decide to jump into this private terminal area with both feet we'll all know it! You can find out more about their dealer program by calling J. Duke Brown at (617)272-3000; extension 1886.

Suite #502 - Satellite Television Systems, Inc. (R #1, Box 132B, Poplar Bluff, MO 63901) appeared with a TVRO antenna line that looked great. They take a panelized approach like ADM but their cosmetic finish is outstanding which indicates somebody has done their homework in designing the package. We overheard several wives telling their husbands 'that is the one I want in our yard' which indicated to us that these people will do well. In addition to looking good and working good, their antenna knocks down for shipment via UPS which of course ought to make them a national force in the antenna business. You can contact Danny Hogg for more details at 1-800-325-0761.

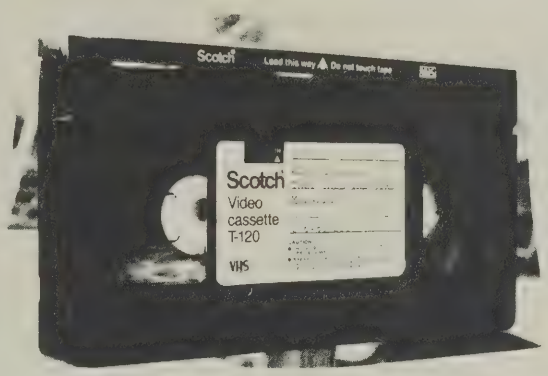


SHIP IT UPS! - Satellite Television Systems private terminal dish was a pleasing mixture of dark and light brown colors.

Los Angeles Suite-The Sound Company (4676 Admiralty Way, Suite 732, Marina Del Rey, CA 90291) brought their own antenna package and a new proprietary receiver design to San Jose. Their suite was always crowded and it had perhaps the largest concentration of video gadgetry of any booth at San Jose. One item we saw that was very impressive (but had nothing to do with the direct TVRO package) was a portable projection TV system that produced the highest quality wide or big screen TV we have ever seen. These people seem to know what the **whole** business is all about and their total package approach (from dish to big screen TV) ought to do well in the upper dollar brackets of this business. You can talk with Joe Miyasaki at (213)777-7737.

Regency Suite - H & R Communication / Starview Systems (Route 3, Box 103G, Pocahontas, Arkansas 72455) showed once again that a young, energetic group from Arkansas can make things happen. John Hastings and crew ran a very professional operation at San Jose with trailer mounted rigs on display (they sold the three they brought with them), a new motorized mounting system ($995 and very nifty), and antennas up to 16 feet in diameter. In the receiver department Starview seems to have all of the bases covered, offering Commtech 'professional' units right on down the line with ICM receivers

THEY CALL THIS BIRD MOLNIYA



A whole family of Russian satellites circling over North America and beaming live Russian television back into the USSR. Now because STT has researched the Molniya reception challenge and developed hardware modifications and software systems to produce high quality Russian television throughout North America, you can share in the excitement of this ultimate satellite TV fantasy!

Until you have witnessed Russia's approach to national television service, you cannot appreciate how fortunate we are to have a multi-channel national service of our own!

STT has put together a 90 minute (approximate) special videotape that explains in great detail how you set up to receive the Russian Molniya transmissions. All of the technical changes required plus a thorough understanding of the unusual moving/inclined-orbit of the Molniya series birds is explained in this special tape.

PLUS - this tape includes a report on the San Jose SPTS reception of Molniya **and** an interview conducted at STT in mid-July with English experimenter Steve Birkill who pioneered reception from both Molniya and Russia's Ghorizont Clarke-orbit birds.

STT videotape THS-1 is available for immediate shipment. Specify VHS or BETA format. Price $60 postage paid US and Canada; $65 (US funds) outside of US Canada.

STT P. O. Box G, Arcadia, OK 73007 405/396-2574

TRAILER MOUNTED - 16 footer from Starview is lifted into position by a winch and gin pole.

on the low dollar end. They also had an operating 'everything at the feed' antenna system which they characterized as 'experimental'. H & R has done more to get people into the dealer business, to date, than anyone else in this field. Talk with John Hastings at (501)647-2001.

Then there was the **Umbrella Antenna** from Robert A. Luly & Associates. Luly was not an exhibitor but he did put on a number of demonstrations with his innovative antenna design and he brought with him a talented crew of cohorts. You can contact Luly about the 10 and 15 foot size antennas at P. O. Box 2311, San Bernadino, California 92406 (714)884-9010.

BEFORE THE CROWD - inside of this dome-tent shortly after picture was taken Bob Luly hooked up his Umbrella Antenna. Then for six hours straight people lined up to go into the tent to view pictures on fold-up antenna.

TECHNICAL CORRESPONDENCE AND NOTES

ANTENNA POINTING PROGRAM

I don't know how many readers would be interested in having a computer program in microsoft that can run on virtually any computer with 'Basic' language but I have developed one to help people determine just where their bird orbit line is from their location. If the program is run(ning) properly the elevation will 'break' as the run passes your longitude. As an example, if your longitude is 121.9 then COMSTAR D1 at 128 will be at 41.6, WESTAR II at 123.5 will be at 42.02 and SATCOM FII will be at 41.95. Since FII is almost exactly the example longitude it will have the highest look angle or elevation in your sky.

John P. Rohner
W. Liberty, IO 52776

Rohner's program follows:

```
10  REM COMPUTE SATELLITE TVRO ANTENNA AIM-
    COORDINATES
20  REM CONSTANTS - RS IS IN NAUTICAL MILES - USE
    42166 FOR KM
30  K = 6.61 : PI = 3.1415927#:RS = 22766
40  REM BASIC COMPUTES IN RADIANS SO THESE ARE
    THE CONVERSIONS TO/FROM DEGREES
50  DEFFNRAD(X) = X*PI/180
60  DEFFNDEG(X) = X*180/PI
70  DEFFNACSN(X) = ATN(X/SQR(-X*X + 1) + PI/2
80  REM INPUT ANTENNA COORDINATES IN DEGREES
    (&&.&&) NO MINUTES/SECONDS
90  INPUT "ANTENNA LATITUDE"; AD
100 INPUT "ANTENNA LONGITUDE"; HD
110 PRINT
120 REM I = NUMBER OF DATA ENTRIES (NAME, LOC)
    TO BE PROCESSED
130 FOR I = 1 TO 15
140 READ SN!,SL
150 W = FNRAD(SL); H = FNRAD(HD):A = FNRAD (AD)
160 L = (H-W)
170 D = FNACSN(COS(A)*COS(L))
180 REM C = TRUE AZIMUTH
190 C = FNACSN (-TAN(A)/TAN(D))
200 IF L < O THEN C = 2*PI-C
210 CD = FNDEG(C)
220 REM EL = ELEVATION BEARING
230 EL = ANT(COS(D)-(1/K)½SQR(1-CSO(D)*COS(D)))
240 Y = FNDEG(EL)
250 REM RG = RANGE TO SATELLITE
260 RG = RS*SQR(1-(2/K)*COS(D) + (1/(K*K)))
```

```
270 PRINT SN!TAB(11)''LOC:.;SLTAB (23)''BEARING:'';
    CDTAB(42)''ELEVATION:;Y;
280 PRINT TAB (62)''RANGE:''RG
290 NEXT I
300 END
310 DATA SATCOM 1,135, COMSTAR 1,128, WESTAR II,
    123.5, SATCOM II, 119
320 DATA ANIK III, 114, ANIK B, 109, ANIK II, 107, ANIK
    1, 104, WESTAR I, 99
330 DATA COMSTAR II, 95, XXXX III, 87, I-IVA-F3,34,I-
    IVA-F2,29.5,I-IVA-F1,24.5
340 DATA I-IVA-F4,19.5
```

FEED HORN SUBSTITUTE

Nearly a year has passed since Oklahoma and SPTS '79. My family and I constantly talk about our trip and all of the wonderful people we met. I wish you published **CSD** every week for I read it the moment it arrives no matter what I am doing; keep up the excellent work!

I have decided to build Jim Vine's 16 footer (even to cutting the trees for the lumber) and Tay Howard's receiver with the Birkill bi-polar LNA (I fear the GaAs-FET is too risky for me). I started recently to make Howard's feedhorn but did not feel comfortable making it out of PC board. Sheet copper in small quantities is almost impossible to find so I chanced upon a less expensive way to do it.

Tay's feedhorn is 5 inches long so I took an ordinary, everyday 3'' diameter copper drain pipe 5.5 inches long and I sawed a 'slit' lengthwise. I heated it carefully and evenly until I noticed the color 'change' following the flame and the metal itself was just barely red. I then allowed it to cool naturally (no water) and gently separated the saw cut enough to get my finders inside. Then I unrolled it along my workbench until it was flat, tapping lightly with a rubber mallet to finish off the sharp edges.

Clean it up with steel wool afterwards (restoring the bright shining lustre of the copper). I then bent the pieces in a vise to the sizes required by Howard. By using a tubing cutter the long edges when unrolled are straight and this allows use of a square for scribing. I used a fine blade in my saber saw to cut it; tin snips cause the pieces to roll and they deform the flat sheet. A piece of 3'' copper pipe 5½ inches long yields a sheet 9-3/8'' by 5-1/2''. I hope this helps others faced with the same problem.

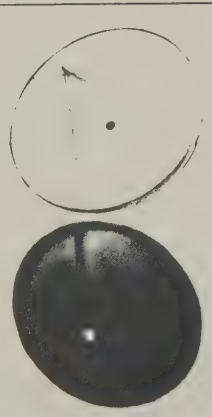
G. H. (Ray) Clark
Oak Ridges, Ontario
Canada

We agree - finding small pieces of sheet copper is almost impossible anymore. We used some brass shim stock recently to build up a waveguide to coax adapter [See Coop's Satellite Operations Manual] **but only after spending half a day trying to locate some sheet copper. A good suggestion and we thank you for it!**

Now available at an affordable price...

PARABOLIC REFLECTOR ANTENNA

Big 10 ft. diameter fiberglass construction with 4 petals and center section. Bolts together easily in 45 minutes. Focal length 48.6, F/D Ratio .4, Gain 39db. Weight 185 lbs.
Reflector only $680.00.
In lots of 10 $585.00.



MINI - CASAT
2207 FORREST ST. TUPELO, MS 38801
601 862-2132 842-8617

TECHNICAL NEWS NOTES

EVERYTHING at the antenna receiver system demonstrated at SPTS San Jose by Starview was not Microdyne system after all. Apparently Microdyne has changed plans on how and through whom they will market system; Starview has developed own package of hardware which they are now testing.

UMBRELLA antenna demonstrated at San Jose will be in limited production by middle of August; Robert Luly expects to be able to turn out hundreds per month by early fall, in both 10 and 15 foot sizes.

FLIGHT rating of high power TWT tubes for 12 GHz DBS systems may be most critical element in any of the proposed systems. Present US and Canadian and INTELSAT birds utilize 5 and 10 watt TWT tubes which are documented by manufacturers for service 'in flight' in space. Higher power TWTs, such as 40 watt devices utilized by Russians and 200 watt devices utilized in recently failed Japanese BSE birds are not rated for flight service in space and are thus subject to infant mortality and pre-mature failures. One of the more significant challenges ahead for 12 GHz DBS satellites is the development of high reliability (i.e. flight rated) TWTs at the power levels required for DBS service.

HUGE panelized spherical TVRO and transmit antennas for DOMSAT and INTELSAT service being developed by USTC (Afton, Oklahoma). One 60 foot by 64 foot version, similar in concept to basic Swan Spherical, is scheduled for installation in central Mexico for reception from US domestic satellites by cable system there. Price will stop the average buyer however; in $150,000 region.

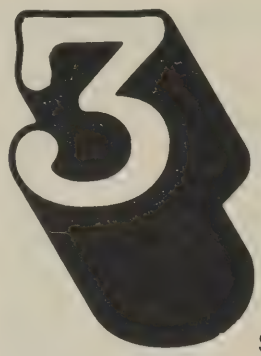
POSSIBILITY that some of the STV feeds will go to satellite for interconnection has cropped up; Golden West Broadcasters, operator of STV services at several US locations, thinking about using satellite transponder to send out scrambled service to each of the terrestrial re-transmission sites.

LATEST snafu at NASA over constantly slipping Space Shuttle schedule is demand by several of the would be users (i.e. satellite launchers) that NASA schedule **2** flight tests of Shuttle prior to taking on commercial payloads. NASA opts for **single** test flight.

ARIANE launch service apparently will slip-schedule after failure of May test flight that dumped amateur radio satellite into Caribbean. Delays of up to six months are forecast, creating additional pressures on dozens of satellites now torn between slipping Space Shuttle and Ariane problems. Bottom line? Many space projects will wait longer to orbit than had been envisioned only months ago.

30/20 GHz test system moving ahead at NASA Lewis Research Center; some $35 million is being allocated to design system that will when operational carry more spectrum traffic than present 4 and 12 GHz services combined.

INTELSAT moving towards time division multiplexing system for all narrow band circuits, expects to increase by factor of four the number of effective voice grade circuits that can be sent through given transponder space.



NEW MANUALS FROM STT

1

Stephen Gibson's 'THE SATELLITE NAVIGATOR' is possibly the finest manual ever assembled by STT. Author Gibson covers every aspect of satellite 'navigating' (i.e. the art of finding satellites from your spot on the ground) and **he builds into this latest STT manual** cleverly designed navigational aids including an inclinometer (to measure your antenna's elevation) and a Sun Compass (to help you accurately measure azimuth). Gibson goes from the very elementary mount (a laundry pole in the yard) to super sophisticated mounting systems including a complete electronic interface box to tie your motor driven dish antenna to your TRS-80 (or similar micro) computer for full 'autodish' operation. Filled with practical tips on mount design and construction, step by step instructions on 'boresighting' the satellites, computer programs galore and the word of an experienced man on trouble shooting your system. Bob Cooper says "I read this manual six times during the course of preparing it for publication; each time I found myself discovering new ways to modify my own antenna mounts. This manual may well be a curse to my spare time; after reading it I have dozens of new projects to get started on!" The price is $30 postage paid US, Canada, Mexico; $35 elsewhere. A must for any serious satellite terminal operator. See order card to right.

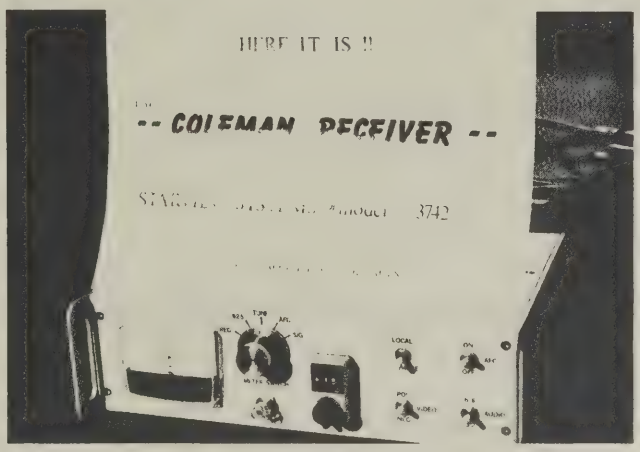
2

Nelson Ethier's 'PARABOLIC TVRO ANTENNA MANUAL' will probably make several people independently wealthy. Here is the full 'game plan' for starting up a business building 10, 12 (or larger) foot TVRO antennas, mounts and feeds. Nelson's manual will make everyone an instant expert on the nitty-gritty world of building superb, high-quality parabolic reflector surfaces. He uses a combination of fiberglass and metal to produce a professional looking, high-performance dish that virtually **anyone can duplicate** from his step-by-step plans for between $300 and $500. PLUS - he suggests that after you build a mold for your first dish that you rent the mold around to others in your area so that you in effect become a supplier in the antenna field! Nelson is a bug for having precision workmanship and he gives you complete instructions on achieving a 1/8th inch surface tolerance over the 12 foot surface. Formulas and instructions included will assist anyone who wants to build larger-than-12 foot antennas to do so. What a neat way to turn your garage into a factory! The price is $30 postpaid in US, Canada and Mexico; $35 elsewhere. Don't start building your own antenna until you study this manual carefully!

3

Bob Cooper's 'SATELLITE OPERATIONS MANUAL' probably should be kept under lock and key in your TVRO viewing room. Coop has been assembling data from people who like to mess around tuning in 'the hidden stuff' on satellite transponders for years and now he gives away all of the trade secrets. Like finding network executive intercom audio channels, news-wire teletype channels, the Moscow-Washington 'Hot Line' RTTY and voice link back-up on Molniya and more mundane stuff like several dozen Holiday Inn 'Holidex' 800-number reservation lines on satellite. He tells you where to tune in four different Anchorage, Alaska AM radio stations sent out via satellite, Alaskan flight weather, and hundreds more. PLUS - this manual is more than a clandestine sourcebook for the secret services. It includes dozens of step-by-step instructions for LNA and feed system operation, sub-carrier units, and a whole chapter on the latest Russian Molniya reception techniques. It even has a section detailing re-broadcast of satellite received channels via low-cost VHF television translators (including a look at such an installation). A section on trouble shooting your system; more than 20 chapter-sections in all! If you are into satellite reception, you need this new Coop manual. If you are thinking about getting into satellites, one look at this book and you won't rest comfortably until you too have your terminal up and running! The price is $30 postpaid in US, Canada and Mexico; $35 elsewhere. See order card to right.

Starview Systems Has ALL OF THE STARS COVERED!

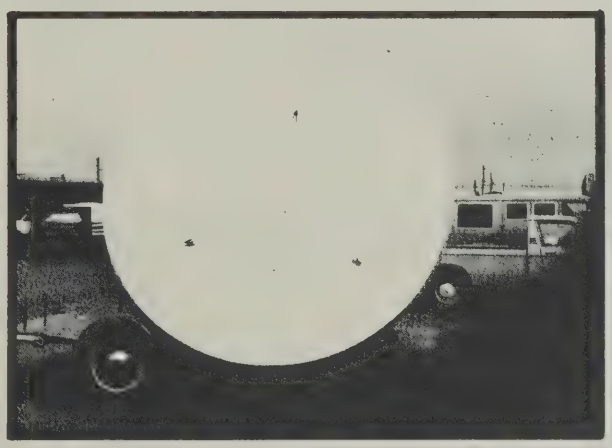


NEW!!! Everything At Dish!
Starview Systems has teamed up with Robert Coleman to introduce the ultimate low-cost complete system. Shown first at SPTS San Jose, the full TVRO receiver (including LNA portion) mounts at the dish! Our 10R system has a complete 10 foot dish antenna, plus a remotely tuned receiver that is housed at the dish feedpoint. Just bring down the low-cost RG-59/U to your TV receivers. Here is a **complete** system that delivers NTSC re-modulated satellite signals on VHF channels 3 or 4. The price? A real breakthrough at $4495! Find out more today.

NEW!!! Coleman 3742 Receiver!
Scan-tuned, multiple audio sub-carriers, local or remote control, superior threshold performance, full metering, double conversion of course. And available exclusively from Starview Systems. Ask about early delivery today!

LNA SUPER SALE - Continues!
Just $795 for a top-of-the line Avantek 120 degree Kelvin, 50 dB gain low noise amplifier with the new 'power block' DC coupling system that allows you to use your TVRO downline for powering! Instant delivery on this top grade LNA at the unbelieveable price of $795!

STARVIEW DEALER SPECIAL
Get in on the ground floor as a TVRO dealer in your area! Starview Systems provides you with everything you need; professional instruction plus the finest mobile sales terminal on the road today. Included is a 10 foot Starview parabolic equipped with rotating feedhorn, Avantek 120 degree K LNA, top of the line Microdyne 24 channel tuneable receiver, 75' of coaxial and connection cables plus a trailer to get you to the demo site and operational in 30 minutes time. And the price? An unbelieveably low $7200!!!



STARVIEW SYSTEMS

H & R Communications
Route 3, Box 103G
Pocahontas, Ark. 72466 [501/647-2001]

COOP'S COMMENT ON PROGRAMMING

SPACE AT SAN JOSE

The **S**ociety (for) **P**rivate **A**nd **C**ommercial **E**arth (stations) got off the ground very well at San Jose. The interim directors who volunteered at Miami were replaced with a new board and a set of officers that will do us proud in the battles ahead. Taylor Howard was elected President and there could not be, in my opinion, a better choice. Tay has every credential there is in the young industry; he's an engineer's engineer, a scholar, a fine public speaker, a 'name' person and a born leader. Plus he has Annie to see that he keeps looking ahead.

We now have some very serious problems confronting us. SPACE's General Counsel, attorney Richard L. Brown of Washington, D.C. managed to scare the pants off of me by bringing with him to San Jose an insider's copy of a new piece of legislation scheduled for introduction into the House of Representatives hopper about the time you read this. Among other things, this 'anti-piracy' bill makes it a horrendous crime to tune in any MDS, STV **and** satellite transmissions which you do not have written permission to access. The bill has apparently been steam rolled by a consortium of worried practioners of the pay-TV trade; people who want stealing TV programs made very unattractive.

How unattractive? Try on a monetary fine of $250,000 if you are an individual or $1,000,000 if you are a corporation!

These guys are serious even if they are mis-informed and terribly mis-guided. They obviously have some clout in DC and they plan to use it. The bill is written so vaguely, according to Brown, that it could be interpreted just about anyway the enforcement agency that might get the bill as a tool wanted to enforce it.

In fact it is so vague that it could put every supplier in this business out of business overnight. Just like that. SPACE naturally has to fight it; to see that the drafters of the bill understand our positions and understand that there is a great deal more at stake here than ripping off 'The Seduction of Joe Tynan'.

As an innovator in this young industry I have long maintained, and stated at every available forum, that our problem with the program suppliers is not that **we** are unwilling to pay their fees, but rather that **they** are unwilling to accept reasonable fees (or any fees) from us. Since we have a mixed bag of free (no charge) services and fee-charged services on the same satellites (and same satellite) plus additional channels filled with private materials (such as pre-network feeds) it is apparent to me that if you have the permission to view PTL (for example) that others who don't want you viewing them should be engaged in some security system of their own to see that you don't watch them. I consider it very poor business for a corporation to lay out $20,000,000 in their own cash for programming, and then stack it on the street car next to the free samples. I simply do not understand how they can expect it to stay there untouched. I wonder if these same people leave the keys in their cars and the car unlocked or stack twenty dollar bills on the doorstep outside their offices.

What HBO does with its programming concerns me not. I haven't watched an HBO movie in a year or more and I don't care if I never see another one. Even in a Holiday Inn. What does concern me is the worldwide lead that American ingenuity has taken in bringing satellite television technology down to the comprehension and pocketbook level of the common man. Tax dollars from **every** American citizen paid for the NASA efforts that led us to domestic geostationary satellites. Tax dollars support the NASA and Skylab launch facilities. I do not like the concept that only the HBO's and the RCA Americom's can use this technology. I have a lot of trouble with the idea that HBO can unilaterally **refuse** to accept private terminal viewers who **want** to pay for the service, and then stack twenty dollar bills on street corners and expect the US government to come to their rescue when they are pilfered. Susan and I spent nearly $1,000 hiring private guards for the displays at San Jose because it was **our responsibility** to the exhibitors to do so. Can you imagine how long the seminars would continue if we opened all of the doors to the displays at night and walked away leaving them unattended?

This bill will kill the American lead in low-cost space systems technology. Taylor Howard will have to go back to teaching at Stanford. Bob Luly's Umbrella Antenna will end up as a backyard solar hot dog cooker. Avantek LNA's will shoot back to $2,000 in a hurry. Everything thousands of people like you and I have worked on for years will go down the drain because firms such as HBO had the political clout to talk Congress into passing special interest legislation that is designed solely to do something HBO (et al) should be doing themselves. Talk about a government subsidy!

If you have not joined SPACE, **do so today.** Don't mess around putting it off. Get on the telephone and talk with Rick Brown (202-387-1856) and find out what you can do besides sending in a modest amount of money ($25, $100 or $500 under the new dues structure). Low-cost satellite TV technology can truly change the world, in a positive way. Let's not let the 'big boys' pidgeon hole this technology for their own private gain at the expense of the millions of people who made it all possible. The time to resist is now, today. Tomorrow may be too late.

COOP'S SATELLITE DIGEST (Programming Section) is published monthly by Robert B. and Susan T. Cooper doing business as Satellite Television Technology (Ltd.), P.O. Box G, Arcadia, OK 73007 (USA); 405-396-2574. **CSD** is not affiliated with any satellite programming distributor, hardware (equipment) manufacturer or distributor nor satellite systems operator. STT sponsors the Satellite Private Terminal Seminars (SPTS) held three times per year and does produce and distribute 'learning' materials and 'how-to-do-it' manuals relating to the development of the low-cost satellite TV receiving system industry. Subscription fee is $50 (US funds) in advance Canada, US, Mexico; $75 (US funds) elsewhere. Copyright 1980 by Robert B. and Susan T. Cooper.

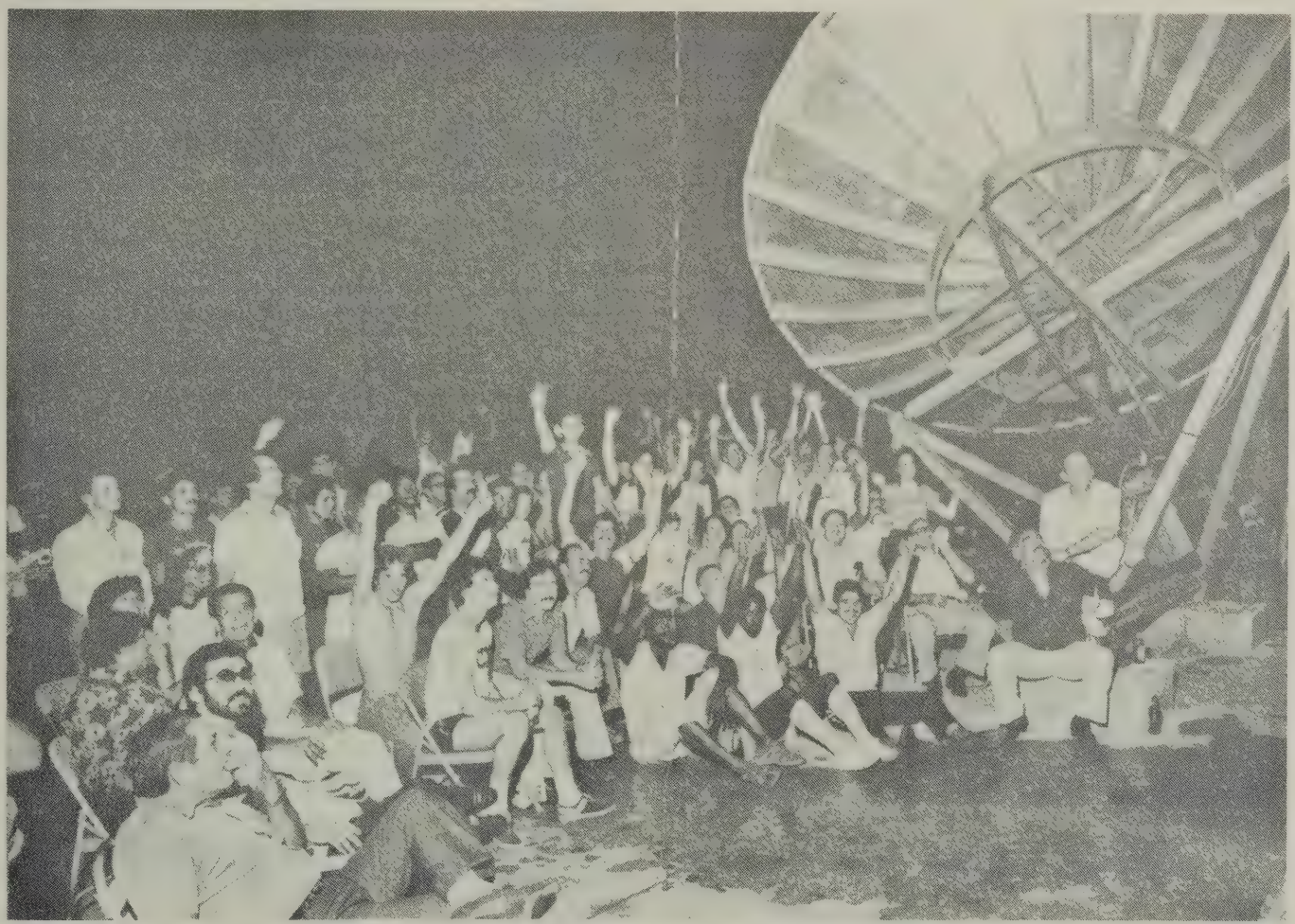
ATTRACT A CROWD? PUT ON A FIGHT!

There are a lot of ways to spread the 'good word' about satellite transmissions around; **Bob Behar** of Florida's **AB Electronics** knows about and has tried most of these. The June satellite telecast of the Leonard-Duran championship fight seemed to Behar to be another opportunity to promote public awareness of the applications of (low cost) satellite technology.

In Behar's view as long as he did not charge people to witness the fight via satellite, he was in no real jeopardy. The drama began however 72 hours before fight time when a Miami businessman, Nathan Robert Rock, innocently asked Behar if a fully operational TVRO could be installed at his home in time for the fight. Behar accepted the challenge of putting in a permanent (as opposed to a trailer mounted) system in the short span of time. The basis for the agreement was a business contract; for an agreed to price Behar's firm would have a terminal operational in time for the fight, at Rock's home, or (1) Rock would not pay for the installation, and, (2) Behar swore his name would no longer be Robert Behar!

Behar considered the challenge just that; a challenge. First he arranged with a Miami machine shop that builds customized bases for the Behar chosen 16 foot Paraframe antennas to get a motorized polar mount turned out in well under the 72 hour timeframe. Next Behar marshalled his forces including Jesus Ignuanzo, Nelson Enriquez, Heriberto Arencibia and Ruben Behar. A twenty-four foot U Haul truck was leased to move the 1200 pound 16 foot antenna plus the 1500 pound customized polar mount. Following a terrestrial trip to the North Miami location Behar's first major problem cropped up; in his judgement the only possible 'good location' for the 16 foot dish would be squarely atop a beautiful, mature grapefruit tree which the family had cherished for years. A test of Behar's diplomacy followed; Mrs. Rock arguing for her grapefruit tree, Behar on the side of the 16 foot dish. It took 30 minutes but Behar won and before Mrs. Rock could change her mind about the relative advantages of satellite TV versus fresh grapefruits Behar's band of merry satellite installers had the tree down and cut into fragrant cord wood.

It took five hours to assemble the satellite dish and the polar mount. It was at this point Behar's crew realized there



PART OF the outdoor crowd of 600 watching the Leonard-Duran Championship Fight on one of the outdoor monitors set up by AB Electronics. Antenna is 16 foot Paraframe with AB designed fully steerable motorized mounting system.

was no way to lift the 1200 pound antenna to the polar mounting support plates. Now finding a crane to come out at 8 o'clock at night is no easy trick; again Behar improvised by locating a friend with a wrecker who had a 16 foot boom to lift with. Again there were new problems since the boom was not quite long enough to get the antenna fully onto the mount but with the wrecker doing most of the lifting Behar's crew somehow managed to get the dish onto station at midnight.

The next day the crew returned to complete the installation and hook up the electronics. By 10 PM the second evening Behar had checked the motorized 16 footer out on 10 different satellites including INTELSAT service from Brazil. The antenna and mount were, at this point, only semi-rigid since Behar had wanted to be sure that terrestrial interference was not going to be an unpredictable problem at the site. So on the Friday morning of the fight a concrete truck arrived with a load of wet stuff to secure the mount in position while Behar and his crew ran remote control lines to allow Nathan Rock to change satellites and feed antenna polarization from the comfort of his living or bedrooms. Behar's crew was just finishing up the final touches when Rock's guests he had invited to the fight began to arrive.

For Behar the challenge was met but the day was still young. Hauling his crew back to his Hialeah AB Electronics plant site they proceeded to set up five television receivers throughout the facility connected to another 16 foot dish installed at the AB facility. Behar had decided earlier that he **was** going to be able to locate the fight on the bird and had in fact sent out press releases and a general invitation to anyone who wanted to attend the fight "free" to drop by his AB plant location.

Several thousand did so, filling the streets and the facility around the AB location to an overflow capacity!

Publicity for Behar's operation was phenominal. Advance publicity prior to the fight sold three elaborate installations in the South Florida area. Coverage in the local newspapers plus additional coverage by the local TV stations brought in orders for another 18 units within days of the championship fight. Behar believes 'fall out' from this exposure will still be selling terminals for him a year after the championship fight. Of course not everyone (if indeed many at all) of those who packed the streets and alleyways around 1783 W. 32 Place in Hialeah are able to afford Behar's space age system. AB prices start at $4995 for a 10 foot system and climb upwards to $16,495 for a fully steerable 20 foot system. But one thing is for sure - Behar established his firm as 'the supplier' of satellite hardware in south Florida with this promotional 'stunt' and by doing so he will be doing big business in not only south Florida but through the Caribbean, central and South America where Miami influence is felt.

TRADE - One family cherished grapefruit tree for a 16 foot satellite antenna that brings in 10 satellites? Sold!

S.P.A.C.E. LAUNCH SUCCESSFUL

SPACE PROGRESS AT SAN JOSE

The Society for Private And Commercial Earth terminals (**S.P.A.C.E.**) announces the following results of its multi-program approach during the San Jose SPTS gathering.

1]President of SPACE is H. Taylor Howard, pioneer developer of low cost satellite TV receiving system hardware and Professor of Electrical Engineering at Stanford University.

2]The Board of Directors is as follows:

a) **William Asip**, Asip & Associates, New York, New York
b) **Robert M. Coleman**, Travelers Rest, SC
c) **Bob Cooper, Jr.**, Arcadia, OK
d) **Sam Conwell**, SES of N. Virginia, Inc., Chantilly, VA.
e) **Gary Deaner**, Starscan, Houston, TX.
f) **Bob Dunlap**, Private Satellite Television, Inc., Charlotte, NC
g) **Royden Freeland**, International Crystal Mfg. Co., Oklahoma City, OK
h) **Gerald Logue**, Calgary, Alberta
i) **L. Russell Keene, II**, Sulphur, LA.
j) **Clark Mihelko**, Fallbrook, CA
k) **Ray Miller**, Satellite Services, Inc., Burnsville, NC
l) **Ralph Payne**, Hubbard-Payne, Inc., Knoxville, TN
m)**Arthur Terwillinger**, International Microwave, Cos Cob, CT

3]SPACE now has 150 members (up substantially at SPTS San Jose) but Rick Brown, General Counsel and VP urges those who have not joined to do so immediately. Under the new dues structure adopted in San Jose, individual annual memberships are $25, corporation annual memberships are $100 and sustaining membership (which includes the placement of a representative on the Board of Directors) is $500.

The most immediate concern of SPACE (and indeed all persons and corporations concerned about the future of low-cost satellite TV technology) is the Congressman Preyer (NC) bill, **HR 7747**, introduced into the House hopper in mid-July. This bill attempts to legislate the question of 'piracy' of common carrier signals (including MDS and quasi-carriers such as STV) and makes it a fineable offense ($250,000 to $1,000,000) for the interception of such signals without approval of the carrier. SPACE's Howard and Brown spoke out in San Jose urging attendees to join SPACE and to lend their **immediate** support to helping educate Congress about the built-in differences between MDS, STV and direct (home) satellite reception. Brown noted **"If this is going to be an industry that offers to rural Americans their first real opportunity to have multi-channel television, something they have been denied to date, we are going to have to get Congress to recognize that rural Americans must have the right to access satellite services. Without that clear definitve difference, satellite reception by private individuals is going to be swept up in the emotionalism surrounding MDS and STV piracy and this industry will die before it is born"**.

You can obtain full information about SPACE and HR 7747 from Rick Brown at SPACE, 1521 O Street NW, Washington, D.C. 20005 (202-387-1856).

FINDING HELP

GETTING STARTED FRUSTRATIONS?

You say you are having problems getting started in business? That everyplace you turn you end up further behind than when you started? You say you wonder if this industry is **really** going anyplace?

Here's a letter, abbreviated in the name of getting to the 'bottom line' of this chap's problems, and our public answer to same. The writer is Jim Beckett and the firm is CFP Enterprises. Perhaps Jim's mistakes will help you avoid a few of your own.

"As far as TV is concerned, I have run the gamut...from installing antennas as a kid and then doing a hitch in the Army as a field tech and microwave tech and then later as a Univac tech and a cable TV tech. More recently I was President of a firm called CFP Communications, Inc., a retail amateur radio 'store'; which bit the dust this year out of the pure desire not to lose money.

"(To get started in TVRO work) **I placed an advertisement in the Ham Trader, looking for dishes. I got some response and ended up swapping some left over ham gear for two surplus 10 foot dishes. Then I spotted Andy Hatfield's advertisement that he was looking for dealers at AVCOM and I called him. When I mentioned my ten foot antennas, Andy offered credit against PSR-3 receiver and I took the ten footer to his home...and waited** (eons) **for my PSR-3. When the receiver arrived I set up the system** (SCI 120 degree LNA) **and had lousy reception. I checked the LNA; OK. Checked the receiver; OK. What was left? The dish!!! I hauled my receiver and LNA over to Clyde Washburn's house and it worked fine. Nuts. I had a warped dish.**

EAGLE

SPHERICAL SECTION ANTENNAS
10, 12, 16 Feet
To be introduced at SPTS '80 Calif.
Moderately Priced

Wagner Industries
Box 559, Alva, Ok. 73717
(405) 327-1877

SELECT YOUR CATV SYSTEM
Satellite Programming
INTELLIGENTLY...

...with **SAT-Guide**

Twenty channels of programming today on F1, soon 35 on F1 and D2. Keeping up with what is 'up', when, is almost impossible. Until SAT-Guide.

ALL F1 programs on **all** transponders are listed in this unique programming guide to satellites. INCLUDES daily program listings PLUS monthly summaries of movies, sports and specials. Only $28 per year from:

SAT-Guide P. O. Box 1569
Division of Commtek Hailey, ID 83333

"Than I spotted Jim Vine's advertisement and decided to make a deposit on the Vines Paraframe antenna. Finances were tight however so I found somebody looking for a fancy receiver although that left me without a receiver. However as luck would have it I ran across a fancy HP gigahertz range signal generator which Clyde Washburn needed so I managed a 'swap' between the surplus signal generator and a wired and tested Washburn receiver with Clyde. Now I had the money to deal with Jim Vines on a Paraframe.

"Why did I sell the AVCOM? Well, since becoming an AVCOM 'dealer' I have received zilch from them. Not a single shred of paper. And what is worse, no technical information at all; not even a engineering manual for possible field service. Having dealt with large manufacturers, I am used to good manuals and information."

Coop's comment. I have a problem with you being a dealer by buying **one** of anything. I have a problem with **anyone** being a dealer with one of anything and that includes the Paraframe you bought. There is a real problem in this industry right now with people representing themselves to suppliers such as AVCOM and Paraframe (to name the two you mentioned) as dealers when in truth they are either (1) only trying to chisel the price down to get a discount for their own **private** use, or, (2) as in your case not really ready yet to qualify as a dealer.

I have been advising our CSD advertisers **not** to advertise price unless the price they advertise is the end user suggested list price. Why? Because we have a mixed readership of end users, people who want to be dealers, people who are dealers and so on. Anytime a price lower than one-quantity pricing is published, people just naturally want to buy at that (lower) price. That's human nature and thrift. But no manufacturer can exist in the marketplace very long when people buy in single quantities at the 100 lot price.

I doubt Andy Hatfield felt you were really a dealer. I think he made his first mistake by agreeing to sell to you as if you were one, before you had **established yourself** as a dealer. You got out of the amateur business because you couldn't make any money at it. Why? Because hams have forced pricing on most amateur gear so low that a dealer can't make it anymore.

I think you will find that when you act like a real dealer, you will be treated like one. Not you in particular; just anyone who thinks they are going to make a pot of gold in this business.

The truth of the matter is what you buy for is almost immaterial. There is no competition at the retail level yet in most areas; you can sell an **installed** terminal for several times what you will buy the antenna, receiver and LNA for. Folks like Bob Behar in Miami and Chuck Colby in California (to name just a pair) find no resistance at the $10,000 - installed pricing level. When you cut corners you cheapen the product and pretty soon cutting corners becomes a way of life. And that's a bad deal.

So what is a dealer? I like Royden Freeland's posture at ICM. **He has no dealers and no distributors.** Anyone who comes in the door and wants one radio pays the retail price. If you buy ten or more you get a price discount. Buy 100 or more and you get another discount. You earn your discount based upon the quantity you buy, not because you cloak yourself in some dealer coat. And we think that is the way it should be.

Jim continues **"It is one thing to publish an advertisement and give flowing praise to a product and another thing to keep your readers aware of problems. It appears now I would have been better off with less wasted time to have dealt with SA, Microdyne, Anixter...just to name a few. Maybe the cost would have been greater, but the quality** (of the products) **would have been better and the performance would be there. And time wasted is money lost. I would not really advise anyone to go to a 'small shop' until they had made a real check on them. And that is difficult to do; right now it is all by word of mouth.** CSD **is in a position to advise readers to be careful when dealing with these new outfits. And I wish you would".**

Coop's comment. There is a lot of room for improvement in all parts of this industry, we included. The early television market, in the 40's, was filled with kits and do it yourself products which loaded the pages of **Radio Electronics** and the old **Radio-TV News.** Then as manufactured gear became more plentiful and less expensive the incentive to do it yourself went away. The same thing is happening in this industry now. Like any field there will always be incentive to do it yourself if for no other reason than the pride that goes with doing something with your own hands. But our economy in North America is not geared to that philosophy (sadly perhaps) anymore; we have become, just as amateur radio has become, a population of button pushers and appliance operators. During SPTS in San Jose we met with several attendees from Canada who had been victimized by a firm operating out of Oregon calling itself **Cascade Electronics**. This firm apparently did some advertising offering TVRO modules (LNA modules, receiver modules and the like). One Canadian we talked with had 'lost' nearly $2,000 to this firm which either never shipped at all or shipped true junk. We got to talking with H. Paul Shuch about this at San Jose and Paul said yes he had heard of this rip-off firm and had even noticed that many of the modules this chap was selling were copies out of various magazine articles that Paul had written as far back as five years ago. One IF passband filter module from this Cascade Electronics which purported to be centered on 70 MHz and 30 MHz wide was constructed with torroid coils that are simply not capable of that type of passband at 70 MHz. True junk, and here were several Canadians at SPTS (plus who knows how many others) who had been victimized by this firm.

Jim continues **"I enjoy the Digest very much as it is very informative and the information isn't available anywhere else. The only thing I can pick on is that I think we have seen enough on the Russian satellites in print...I have no desire to learn Russian although they might start using English someday!"**

Coop's comments. We've had a few letters suggesting Molniya has been worked to death. I disagree although unless there is a major change in its operating parameters we won't dwell on it much in the near future. We are reminded that Tay Howard suggested to us that he would go home (from San Jose) and **look** for Molniya, just to see if he could make it play on his 15 foot dish. But he didn't think he would be watching it much. After he found it he changed his mind. You cannot imagine what kind of trivia the Russians are fed about America and the balance of the non-Soviet-aligned world via Molniya. I maintain that if we could somehow force US Senators and Representatives to sit down to watch just 60 minutes of Russian television, via Molniya, we'd have a whole new ballgame in Washington. In our view, Molniya may not speak our language but in watching it you quickly develop a new sense of pride in our American system. Heaven knows we are not perfect but at least we have the opportunity to **admit** we are not, as we are doing here!

NEED PARTS...
Sat-tec's Got 'em!

70 MHz DEMODULATOR CARD

The Sat-tec D-1 demodulator is the last block in a TVRO system, it is where the 70 MHz IF signal is converted to video and audio. The D-1 contains a PLL demodulator, video processor (CCIR de-emphasis, 4 MHz low pass filtering and 30 Hz clamp), dual sound sub-carrier demod and AFC circuitry. The power requirement is small, 15VDC @ 200ma., signal input is -20dbm @ 70 MHz. AFC will enable the user to lock most any VTO L.O. with no problem whatsoever. Video and audio outputs are a standard 1 volt p-p suitable for driving any monitor, VTR, or modulator.

SPECIFICATIONS:
Signal input: 70 MHz at -20dbm (22mv)
AFC lock range: greater than 5 MHz
Sound subcarriers: 6.2 MHz and 6.8 MHz fully independent
Video level out: std. 1 volt p-p
Audio level out: 1 volt p-p
Power requirements: 15VDC @ 200 ma
Demodulator: NE564 PLL IC
Tuning voltage out: 2 to 13.5 volts
Tuning voltage in: 0 to 15 volts max

D-1 Demodulator Kit $99.95
D-1 Demodulator PC board only $49.95

Part Number	Description	Price Each
Avantek GPD-1002	1GHz, 12 db gain TO-8 can amplifier, 15VDC	$45.00
Watkins-Johnson V802	2.5-3.7GHz VTO, lower noise than Avantek types	120.00
Watkins-Johnson V705	600-1000MHz VTO, lower noise than Avantek	120.00
Signetics NE564	PLL selected to operate at 70MHz	7.50
Van-L DBM-500	4GHz mixer, SMA connectors	85.00
Amperex ATF-417	1GHz, 25db gain hybrid amplifier, 20-24VDC	19.00
Motorola MWA-110	400MHz, 14db gain, -2.5dbm	9.00
Motorola MWA-120	400MHz, 14db gain, +8dbm	9.75
Motorola MWA-220	600MHz, 10db gain, +10.5dbm	12.40
Motorola MWA-230	600MHz, 10db gain, +18.5dbm	13.50
Motorola MWA-310	1GHz, 8db gain, +3.5dbm	12.40
Motorola MWA-320	1GHz, 8db gain, +11.5dbm	13.50
Motorola BFR-90	3GHz F_t NPN transistor, 15db gain @ 1.2GHz	2.50
Motorola MRF-901	3GHz F_t NPN like BFR-90 but 2 emiter leads	2.75
Regulators 7800 Series	5V, 8V, 12V, 15V, 1A TO-220	1.50
Regulators 7900 Series	-5V, -8V, -12V, -15V, 1A TO-220	1.75
IF Transformer	10.7MHz IF can be padded to 6.2 or 6.8MHz	1.25
Tuning capacitor	10pf multi-turn for filters, PLL, etc.	.95
Coil form+can set	Nice coil form set for filters, good to 120MHz	2.00

Sat-tec Systems; Box 10101
Rochester, NY 14610; (716)381-7265

GENUINE HOWARD TERMINAL PC CARDS

Bob Coleman and Tay Howard are now producing six PC cards which make duplication of the Howard Terminal (latest version) a snap!

(A)Dual Conversion (4 GHz to 70 MHz) - $25.00
(B)70 MHz IF and Filter - $25.00
(C)Howard Demodulator - $40.00
(D)Dual (2 channel) Audio - $25.00
(E)Single Channel Audio - $15.00
(F)AFC and Metering - $15.00

These field proven and tested high quality boards are available as a five-board-package for $99 package price (you receive A,B,C,E and F above). Included is complete documentation for construction and a list of parts stocking distributors.

Order from: Robert M. Coleman, Rte. 3, Box 58-A
Travelers Rest, S.C. 29690

DEAR COOP

SINGLE CONVERSION technology session featured CSD authors David Barker [GHZ Engineering; left] and Norman Gillaspie [right]. Gillaspie also covered NEC powered LNA designs. [SPTS San Jose]

Because Coop is so hard to get on the telephone (some would say impossible!) we encourage people who feel they need some information he has filed away to write. Several hundred such letters arrive each week, many are answered with a note penned across the bottom often by hand. It is simply far more expedient to go through a stack of 50 letters or so at a time dashing off a quick response than it is to constantly get up and down from the typewriter or a videotaping session (bringing everything to a halt) to answer a telephone call. No big deal...that's just the way it is.

M. Rejean Mathieu of Baie James, Quebec decided to write a letter. He set a record...36 handwritten pages! After the shock of opening the huge envelope had passed and an hour was spent deciphering Jean's handwriting it became obvious that no quick note dashed along the bottom of page 36 was going to do justice to this monumental effort.

Jean attended SPTS '80 Miami and many of his questions and concerns stemmed from that experience. Let's see what's on his mind because chances are some of what he thinks about may be on your mind these days as well!

"I disagree with your way of running the seminars. With two sessions going on at the same time there is no way to catch everything. Perhaps some sessions could be run in the evening?"

We run twin or parallel sessions because we recognize that not everyone is an engineer or even cares what happens to the electrons inside the LNA; so we attempt to schedule high-technical and either non-technical or semi-technical sessions at the same time. In this way a chap interested in getting into this business for profit can attend the not technical sessions while perhaps his technical partner can attend the high-technical sessions.

"Where was Coleman's active mixer? I wanted to see it work, to see a live demo of it with an IF and a demod so we could compare the pictures."

Coleman had it all with him but he couldn't find antenna that would accomodate him. He did bring with him a super home-made videotape of the system in operation and we announced (and Bob displayed) that tape several times, especially on the second day at Miami. Sorry you missed it.

"Where was the Swan antenna? Where was Birkill? John Kinik of KINTECH, NEC, VARI-L, Englemann, Vitramon, Rogers Duroid, etc?"

With Oliver Swan's death there was no way Oliver's widow could get an antenna to Miami. However the spherical designed by Hayden McCullough (the '8 Ball Antenna') was up and operating in San Jose and there was be a BIG (or should we say 'little') surprise in this product area. Steve Birkill works for the BBC in England and while we **did** bring him over to a conference in the summer of 1978 (see separate report in June issue) there is no way he can get away very often. We hope to get him back at a future SPTS and when we work it out, you'll know about it far in advance here. As for John Kinik (he was at SPTS '79 in Oklahoma with his antenna 'kit'), here's a story that will curl your hair. John was working for Philco-Ford in their satellite division during the summer of '79. On his own, with his own money and in his own spare time, he developed the Kintech antenna kit that we have written about and described in videotape. After the SPTS '79 show his employer discovered what he was up to and they called him on the carpet. In short they advised him that his 'written contract' with them included a paragraph that stated that ANYTHING he developed while working for Philco-Ford belonged to them. John ended up in court, he lost his job, and Philco-Ford got an injunction prohibiting him from marketing the antenna. And as for that long list of microwave hardware suppliers...well, apparently you have missed the on-going message in **CSD**. Microwave parts suppliers (with the possible exception of Avantek and DEXCEL) don't want anything to do with us! They don't understand this market, don't want to hear from you or me, and certainly would not appear at SPTS. To them this whole thing is very un-microwave! Need it spelled out clearer? They are in the dark ages and believe that the microwave region is only for super-sophisticated types laboring away in pristine laboratories.

"The ham net on 14.311 on Sundays is too short. I would like to find other Canadians who can move down below 14.200 after the net is over to carry on."

Good idea. How many Canadians want to join Jean? His call is VE2EUI.

"Looking through a voltage regulator manual I spot the 723 IC regulator which has much better line and load regulation specifications than the 7800 or 7900 series regulators. What do you think?"

Most of the PLL receiver designs utilize an AFC that has a minimum range of + /-5 MHz. Stiff regulation is not a problem with the AFC working and most people get up and change transponders every now and again anyhow; unlike CATV systems which dedicate a specific receiver to a specific transponder and just leave it there fulltime.

"What are the techniques for soldering chip capacitors?"

Do it carefully. Bob Coleman has a large stand-mounted magnifying glass which he places the board under and then he works with plastic tweezers and a small (25 watt max) iron.

"Please run some articles in CSD **on how to hook up cheaply multiple receivers to a single LNA/antenna for simultaneous reception from several satellite channels."**

No trick to this; just install a hybrid splitter (try Merrimac in West Caldwell, N.J. - listed in January 1980 **CSD**) for a single input and then 2, 4 or 8 outputs to descrete receivers.

"One guy selling antennas had a commercial LNA looking at the dish surface and there was no feedhorn on the LNA. He told me there was no loss of signal whatsoever. That told me what you have written repeatedly; i.e. that a lot of this engineering crap we get shoved down our throats by the so-called professionals is just so much %‡&*!."

The fact is that you **can** get pictures without a feedhorn on a typical commercial LNA that has an input cavity feed and a pickup probe inside. But to state flatly that a feedhorn makes **no** difference is **not correct**. The flange on the LNA is really a section of waveguide with an open mouth. If you look closely at some of the prime focus feeds available on commercial Prodelin dishes, for example, you will notice that they have a questionmark (?) shaped feed with the top of the curly-cue directed back at the dish surface. This is an open hunk of waveguide, sometimes flared slightly, and it is a feed. However this open end has a 'pattern' like any other pickup antenna and that pattern must properly illuminate the dish surface. Most feed designers attempt to illuminate the dish from 10 to 15 (-10 to -15) dB down reference the 'boresight' or center of the pattern. A commercial LNA flange with**out** a feedhorn attached is apt to be a long ways from -10 to -15 dB (down) at the edges of the dish; more like down 30 or so. This says you end up, without a horn attached, illuminating only the central portion of the dish with the particular f/D ratio of the dish and you lose signal. The actual **system loss** may amount to -3 to -8 dB in **carrier** level. If you could really pull the feedhorn off and still have 'perfect pictures' (i.e. "It doesn't make any difference..."', to the eye, because the additional loss of the system without the feedhorn still results in pictures that are above sparklies), this would simply tell you that you originally had an excess signal 'margin' above the amount of loss encountered by removing the feedhorn.

On our STT 20 foot dish (a USTC prototype that probably works more like a 16 footer in today's world) we can take off the feedhorn and from sparklie-free pictures we go to signals 2 to 3 dB below threshold.

"I have heard you say and have read from CSD **that the parabolic antenna efficiency is around 50-55%. Can we have an article that explains what is involved in making a dish more efficient [or less efficient if you goof!]. My thinking is that if there are ways to increase the efficiency of the dish to say 60 or 70% that this would be a worthwhile area to explore rather than to continue to be married to these expensive LNAs."**

That's a tough one to answer in short form. Briefly, **the feed** is the primary culprit. Remember that designers try to get the edges of the dish down 10 to 15 dB relative to the center of the dish. This is done to achieve a sufficiently narrow 'pattern' on the antenna system as a whole to insure that you [**1**] can distinguish **between** birds that are parked at 4 degree increments, [**2**] do not **'see'** the earth behind or to the side of the dish with the feed since the earth is a 300 degree K noise source and if you 'see' too much of it with your feed you end up establishing a system noise floor which will be 300 degrees K **no matter what LNA** you put on it. So there are 'trade offs' in antenna efficiency for antenna pattern. There is one antenna design called a Cassegrain which requires the installation of a sub-reflector at the normal prime focus feed point (not precisely there but in that general area). This sub-reflector re-directs the dish collected energy back towards a feed located in the exact center of the dish which is equipped with a horn of special design that 'sees' the sub-reflector. Such a dish can routinely increase system gain by 1 to 1.5 dB over an antenna of identical size utilizing a prime focus feed. So why doesn't everyone use a Cassegrain feed? The mechanics are very expensive; tooling for the sub-reflector must be extremely precise (you don't batter one out of an old hub-cap!) and precise means expensive. The SA Commercial dishes take this approach but others in the commercial field think that

TED SPILLERS [left] of STAR gets the straight scoop on which way is 'up' from STT's Satellite Navigator Steve Gibson.

ultimately they will figure out a way to improve the efficiency of the prime focus feed to match or come close to the Cassegrain.

'''Since LNAs seem to be prone to voltage surges from lightning and line-switching-transients, I know that mine will never be connected directly to any type of supply line [DC or AC]. I intend to use rechargeable Nicad batteries with a small trickle charger supplying voltage to the batteries. I would also use many sections of LC line filtering and if one is to believe General Electric in their 'Transient Voltage Suppression Manual' **I would also use MOV [metal oxide varistors] across the AC line to the charger, from each side to ground, on the AC secondary both across and to ground and on the DC supply lines going to the battery system. Maybe I am overly cautious but these darned GaAs-FETs are the 'fastest gun in the west'!''**

True, true, true. Commercial LNA suppliers have learned a great deal about protecting GaAs-FETs through the ten thousand or so LNAs now in service in this field worldwide. MOV devices, fast rise time voltage regulators and a whole bag of tricks are employed. A GaAs-FET is aptly described as a **very fast fuse**. It does not like spikes or surges or transients and it will 'zap' in milli-seconds. We do exactly what you suggest; run our LNA off a DC battery supply, trickle charge it with a 200 mA charger and MOV the system to death. We have never lost an LNA to switching or transient surges nor to lightning.

''How come Microdyne has single conversion TVRO receivers in their highly rated commercial line and Paul Shuch stomps up and down with indignation anytime somebody suggests single conversion is viable?''

Microdyne gets away with single conversion because they have designed a high quality 'tracking filter' that hangs across the input to their receiver(s). This effectively insures that the 'image' frequency is eliminated (or put so far down as to not be a problem). Tracking filters at 3.7 to 4.2 GHz are expensive gadgets; and they require great patience and lots of test equipment to get right (i.e. align). They also add input circuit loss (i.e. increase the noise figure) which in the earliest Microdyne receivers (i.e. such as the 1100 TVR) was compensated for by installing around 20-25 dB of 'pre-amp' gain in the 3.7 to 4.2 GHz range. **This gets to be** a hassle; **first** you decide not to double convert so that means if you can't stand images that you have to have a tracking filter. But the tracking filter **adds** input noise figure because it has loss so you then tack in a relatively high technology pre-amp. Microdyne makes excellent radios; we've had an older version for years and in spite of its battleship complexity we have had good service from it. But nobody could ever work on it unless they were trained in the specific Microdyne alignment and trouble shooting techniques and had the special test jigs it requires.

We said several issues ago that somebody would do right well for themselves if they were able to develop a low-cost, easy to align, reasonably priced 3.7 to 4.2 GHz tracking filter. The challenge still exists and when somebody does it all of the best arguments for double conversion radios will go away!

''On page 11 of the Howard Terminal Manual it mentions that some modifications are required in the Howard Terminal LNA board for the Airtech bi-polar transistors [when substituted for the HP devices]. What are those mods?''

Forget it. Airtech announced lower (than HP) priced 6101

INVASION FROM SPACE - Imagine stepping out of a time machine onto the Hyatt pooldeck area and finding large 'mushrooms' growing all around!

and 6102 type bi-polars last summer and then withdrew them from the market claiming there was not enough market out there for them to keep them in the line. We figure that is hogwash; they probably didn't have them figured out in the first place and never should have announced them at all.

ON RECORD - ACE TV's Dana Atchley, III and his crew created more than 30 hours of new videotape during SPTS covering the seminar meetings and the outdoor and exhibit events.

SPTS TV CONTROL CENTER - Gary Willhoite holed up in a 'secret suite' at the Hyatt for four days and cranked out more than 70 hours of pre-recorded programming on VHF channels 8 and 9 to the hundreds of attendees who either watched or videotaped to take home with them the events of this and past Seminars.

"How can an orthocoupler be built so a terminal can receive both polarizations at the same time without having to rotate the feed?"

For the unwashed an ortho coupler is a 'beam splitting device' that installs at the feed between the feedhorn and the LNA. It may have a feedhorn built into it. What it really does is separate polarizations into two separate 'ports'. It does this by utilizing carefully positioned and sized metal 'vanes' that insert into the feed cavity. Thus it has one input (from the parabolic surface) but two outputs (one for vertical and one for horizontal). Onto each output you attach a separate LNA, run a separate line for each to the receive location and either employ a pair of separate receivers or a 3.7-4.2 acceptable coax switch to select between the two feeds.

We have never seen a build-it design on one (**anyone want to send one along?**); know that the commercial couplers cost from $300 to $900 each and really believe that since you have to at least have twin LNAs and twin downline runs that it is not a very practical approach for the typical private terminal.

"In the October CSD on page T7 you talk about 'C to N' and 'S to N'. What is this all about?"

C to N (more appropriately C to N + N which is carrier to noise plus noise) and S to N are the two measurements done to proof a terminal. C to N relates to the ratio(in dB) between the incoming carrier from the bird and the noise of the system. This is a measurement done most appropriately at an RF (i.e. non-baseband) point in the system. S to N is signal to noise and in this application it relates to the video (baseband) ratio between video voltage and noise voltage.

A C to N ratio, measured with a power meter device, in the 10 to 15 dB region is considered about right; the lower the ratio (i.e. 10 here) the less 'margin' you will have. The typical receiver (not the LNA; the receiver) has an 'FM threshold point' in the 11-13 region. In effect, this is the point where if the carrier is equal to or greater than this 'threshold point number' you will be just out of sparklies. That means that if the receiver has a threshold of 11 dB you must have a C to N of **at least 11 dB** to be 'above sparklies' (i.e. no perceptible noise in the picture). The difference between the C reading, above and beyond the receiver's threshold point, is called 'margin'. If your receiver has a threshold of 11 (dB) and you have 14 dB of carrier present (as measured with a power meter) then you have 14 - 11 or 3(dB) of 'extra' (excess) signal; your 'margin'.

The S to N measurement is done at baseband by connecting a scope or waveform monitor to the video output. You use some weighting filters to arrive at the right measurement criteria, align the peak video voltage level across a reference line on the scope display and then crank out the signal and measure the 'noise floor' of the system. The difference between the two is the S to N.

In the commercial world an S to N of 48 dB is considered 'CATV quality' video; that means it looks darned good. But broadcasters won't accept a feed that is 'this shoddy'; they insist on having 51 dB video signal to noise as a minimum before they will use the signal for re-broadcast purposes. The terrestrial Telco links do it one better; they want to see 54 dB S to N in most cases before they consider the signal passable.

A 48 dB S to N has no perceptible noise in the picture. But (depending upon the monitor and some other factors) when you drop below 48 dB by a dB or so you will start to see 'grain' in the picture (i.e. fine grade noise). A S to N of 46 dB is still a pretty decent picture and 90% of the people would look at it and rave. The other 10% would say there is 'perceptible noise' present.

"Did Coleman try using his TD-2 mixer right at the feed horn or did he use the open end of the TD-2 as a 'horn'? What kind of results did he get?"

He tried everthing he could think of including building a Cassegrain sub-reflector out of a discarded dishpan! The TD-2 'flange', like the LNA flange, will act like a feed of sorts but as previously explained it will not properly illuminate the parabolic surface so there is loss that should be avoided here.

"I intend to build the Howard Terminal receiver all in one box and then when it is operating properly put the dual conversion board into an insulated box with a

RICK SCHNERINGER at the STT booth saw to it that 600 + attendees and 35 exhibitors co-existed peacefully through the four day event.

heating system and thermostat and install it out at the dish. Is the Richardson thermostat system described in CSD for February 1980 [page T13] adequate for this purpose?''

It is. The primary reason why somebody wants to install the downconversion system at the antenna is to escape the feedline losses at 3.7 to 4.2 GHz. Or the expense of reasonably high grade coaxial cable.

If the coax run is going to be in the 40-60 foot length class, and if you will have 35 dB or so of gain at the LNA, some receivers (Washburn, ICM for example) will run well with just RG-9/U or RG-214. There is a trade off here; you can use less expensive coax (i.e. less than 1/2 or 7/8ths inch hard line / Heliax®) **provided** you are either willing to use a short run of coax and/or an LNA with more gain. The ICM receiver, for example, uses the Shuch 'balanced gain approach' which means that with 30-35 dB of gain at the LNA, the same amount at 1200 MHz (the high IF) and about the same amount at the lower IF (70 MHz) the 90 dB of system gain required for proper performance is met. In fact, if you put **too much** LNA gain **in front of** an ICM receiver the unit goes crazy and produces poor pictures. Shuch designed it this way so that a fellow could save money with his LNA buy. Washburn took a similar approach in balancing his gain while others such as AVCOM design around a 45-55 dB gain LNA.

''I must have read the Coleman Manual over and over to figure out where he is talking about the bi-polar and where he is talking about the GaAs-FET LNA boards. Is the PC layout at the top of page 12 for a GaAs-FET LNA or for the bi-polar described on page10? Or is it for the GaAs-FET on page 11? On page 11 the third paragraph says 'The HP schematic show...'; what HP schematic?''

Sorry about the confusion. It goes much deeper than you indicate. Bob Coleman's approach to the LNA has been to simply take the HP layout (appears on page 12) and plug into it either bi-polar transistors, **or** GaAs-FETs. Bob will tell you that he has never attempted to **optimize** a board for GaAs-FET; he simply utilizes the same board for whatever device he wants to experiment with.

Others will tell you that you can**not** do this and expect to learn whether a particular NEC or Mitsubishi or whatever GaAs-FET device is in fact suitable or better than what you started out with. The (S) parameters for the various GaAs-FETs vary from device to device. These are the parameters which characterize the GaAs-FET and with which you work out the optimum etched-on-board dimensions and physical configuration for the system you are building.

We published one man's approach to optimizing GaAs-FET LNAs in the May **CSD**; see page T10 and the report by Kenneth Rae. This experimenter rigged up a low-cost swept display system to allow him to play around with the circuit loading to achieve an optimum performance balance within a stage and between stages. The best approach if you are equipped to do it is to run the S parameter numbers through some complex equations and end up with the exact recommended physical dimensions for the particular device on the board; and then proceed to build the board that way. Paul Shuch covered this in his SPTS presentations in Oklahoma City and Miami quite well; another person who does this routinely and who seems to do it well is John Rohner of **Rohner Machine Works** (7th and Elm Streets, W. Liberty, Iowa, 52776). John is a very adept computer programmer and he has worked out various programs to allow him to compute design boards for various LNAs and whatever.

The bottom line on building your own LNA is this. **Even if** you start out with a circuit board that has been designed utilizing S parameters for the particular device you have chosen, you stand less than a 10% chance of getting peak, optimum, performance with the stage (or stages) **unless** you are willing and able to go in as Kenneth Rae does and tweek and carve and play with the stage. Virtully any board available (including the much-duplicated HP application note board utilized by Coleman and as appearing in the Coleman and Howard Manuals) will provide **some** gain with almost any 4 GHz rated device. BUT - optimum gain (say the difference between 6 dB and 10 dB) and optimum noise figure (say the difference between 2.0 dB and 1.2 dB) will come only by tweeking as Rae does. If you happen to hit it right off the bat, you should kneel down and say a silent prayer. It may never happen to you again.

This is the BIG reason why commercial LNAs are holding their $800-$1200 price tag these days even after GaAs-FET transistor prices have dropped from $300 each to $50 or so each; the commercial units are hand tweeked and that requires $20,000 in test equipment per tweeking station and **sometimes** hours of tweeking time by highly paid, professional people. When some enterprising LNA manufacturer figures out how to 'automate' this function, then and only then will LNA prices

SATELCO- High Quality Private Terminals

SPECIALISTS IN OVERSEAS systems for domestic and Intelsat television reception, fast processing of export orders and design and sytems for 'difficult' reception areas. Antennas from 10 to 20 feet available.

PLUS - currently closing out inventory on a popular brand 10 foot TVRO parabolic (and some associated electronics); **we can save you real money** whether foreign or domestic buyer!

SATELCO- 5540 West Pico Blvd.
Los Angeles, CA 90019
[213] 931-6274

GHZ ENGINEERING

David Barker
P. O. Box 33205
Phoenix, AZ 85067
[602]266-9749

really come down to where they ought to be!

"Please advise me where I can locate scrap Telco gear such as the TD-2 or dishes in Canada. I was told by a telephone engineer that when this stuff is taken out of service they send it to a scrap yard where it is all melted down for bulk metal."

That's one way to keep their technology a secret. Hitler burned books; the Canadians burn microwave equipment!

"In the March CSD it mentioned the booths of Avantek, SCI, and DEXCEL. I must have gone around the exhibit hall 100 times and I never did find SCI. How come?"

SCI is Scientific Communications, Inc.; they are now owned by Gardiner Communications Corporation in Houston, Texas. Their booth was called STARSCAN which is their corporate name for their private terminal sales division. SCI's Tom Humphries appeared on the program as did big-boss Clifton Gardiner. We thought they were hard to miss; certainly there were lots of SCI products laid out in the STARSCAN booth.

"Your manuals and CSD have a poor binding system; they fall apart in no time."

Good grief. They are NOT bound on purpose. We know because we have been doing this sort of thing for twenty years or more that publications like these are used and used and re-used hundreds of times each. No binding method known to man would hold up to this. So Coop made a decision going in that he would three-ring (hole) punch the manuals and **CSD** so **the user** could insert them into a standard binder. In this way they will hold up for a much longer time. The bronze colored brad is simply to hold them together until they arrive to you; after that, you should put them into a three ring binder of your own choosing.

"In the April CSD, page T9, Washburn talks about regulator noise. He does not explain what troubles it causes. What is this problem?"

A voltage regulator can be likened to a wide band white noise source. A white noise source is one that emits a broad spectrum of noise (and you can measure this with a signal strength meter or a spectrum analyzer as for real-world-level) which is quite constant in amplitude. Now this was not what a voltage regulator was designed to do and in fact only some do it; even **only some** of a particular device number may do it while others are 'not noisey'.

When a voltage regulator that thinks it is a noise generating (diode) device creates noise, this noise generated source sends the noise through the DC circuits where it mixes with the video. The effect is to have a noisey video amp or a noisey video anything. Obviously one of the last things you want to mix with video in a video amp in a TVRO receiver, after you have fought all the way from 4 GHz to eliminate or suppress noise is 'baseband noise'. Washburn discovered as he was fighting a noisey picture that a small percentage (perhaps 10%) of the particular regulators he was using were 'noisey'. He felt that if he bought some regulators that were closet-noise-generators that others may have also been just as unfortunate. The problem is not unique to his receiver; anyone using this family of voltage regulators with any receiver can have it.

"It is no good to me to read that 'Spisar reports he is obtaining improved S/N performance with his discriminator that he can obtain with a PLL demod'; what does that mean? Improved in what way? How about some direct comparisons, side by side, between Coleman's single conversion active mixer, Tay Howard's receiver, a Microdyne, an ICM, a Washburn and so on? Tell us which one is best!"

Best for what? For whom, under what specific conditions? Regardless of price? Regardless of antenna size? Regardless of LNA noise figure? Regardless of transponder transmission parameters?

If there was one **single** best for all seasons, all conditions, we'd tell you. There is no such animal. Coleman's single conversion works much **better** than the pro's think it should. Tay Howard's receiver gets **better** all of the time; which says he keeps improving it's performance while trying to whittle down the cost of building it. A Microdyne receiver is a **superb** running commercial radio and it costs like one of its class should (or at least like the rest of the CATV/commercial units do). ICM's are the **best** selling private terminal radios today. The Washburn receiver was tested by a CATV commercial type firm where it outdid (in S/N performance) all but one of the high-dollar (over $3,000) radios; and that one it tied.

There was a side by side test of sorts at SPTS in Miami during the BrasilSat reception. An AVCOM, an ICM, an A-B Electronics and Paul Shuch's 1980 version prototype all were compared on the one-half transponder Brazilian reception. The new Shuch prototype was clearly best by perhaps 1.5 to 2.0 dB S/N. Does that make Paul the best receiver designer? Not at all. The clue here is 'half transponder' which means deviation is limited on the downlink signal to a maximum of around 17 MHz. When the deviation is cut back, a phase lock loop demod can handle it better than a conventional discriminator such as the AVCOM uses. A PLL is inherently a bandwidth limiting demod; it actually adjusts itself to the video bandwidth present. That's why Steve Birkill has been so successful in England recovering INTELSAT feeds with his small 8 foot dish. His PLL adjusts (and is further tweeked into adjustment by Steve) to recover less than a full bandwidth. In Steve's case he adjusts it down as tight as 4 or 5 MHz bandwidth but in so doing he loses definition (i.e. resolution) except when they are transmitting a static pattern that is not widely deviated.

"Can the Birkill hybrid mode feed be installed on a rotor to recover both polarizations?"

PARKING LOT FULL - antennas were spread throughout facility [22 in all!]; here Hamilton Satellite Systems [front] plus several H & R [Starview] 16 and 10 footers [behind] scan the skies.

REMOTE CONTROLLED - Microwave General 16 footer had on-trailer plus in-booth remote controls for antenna positioning.

ACROSS THE POOL - STAR 13 footer [left] starts going together while on the right the ADM folks have their 11 footer ready for the LNA.

MICROWAVE GENERAL's 16 foot trailer mounted rig featured their low-profile mount; behind, the Hubbard-Payne dish.

It could.

"How come the Howard receiver doesn't use any ferrite beads and feed thru capacitors while the Washburn uses both and the Washburn had channel 4 TV blocking while the Howard had none at Miami?"

Taylor Howard shields everything he builds pretty well; Washburn opted for more open construction. A piece of tin or copper as shielding is always a good idea even when you also use ferrite beads as RF chokes and feedthru capacitors to block RF.

"In the Spisar article in the April CSD [page T2] he mentioned using a single downconverter to get 3.7 - 4.2 GHz down to a single high IF [say 500 - 1,000 MHz] and then using multiple second conversion systems to selectively take one channel at a time out of that high IF on down to 70 MHz and demodulation. I read an article in Communications News magazine authored by one of the fellows from Avantek who appeared in Miami discussing exactly this. Why isn't this a good idea?"

It is, but it is not new. A chap named Steve Richey developed this approach back in the summer of 1978 for a firm called SATCO. This firm folded up about a year ago although perhaps 50 CATV type TVRO receivers were built and shipped utilizing this approach. More recently Hughes Microwave has come out with a similar package. It works this way. The 3.7 - 4.2 GHz signal is downconverted to the high IF. The whole 500 MHz range is present in the wideband high IF. Then individual second conversion downconverters select the appropriate 36 MHz wide portion of the high IF where the desired transponder channel is 'resting' and carry it on down to 70 MHz and demodulation to video and audio.

The advantage to this system is that you could stack up to 12 separate channels (one for each transponder) of demodulators after a **single** 3.7 - 4.2 GHz to high IF downconverter. If you are a CATV system taking multiple channels off of the bird simultaneously, this begins to make sense since a single high IF to demod box costs less than a full 3.7 - 4.2 GHz to baseband box.

The disadvantage to this is that if you lose one downconverter you lose service on **all** of the satellite channels since **you only have one downconverter**! Like we said earlier, there is no 'one-best' system in anything.

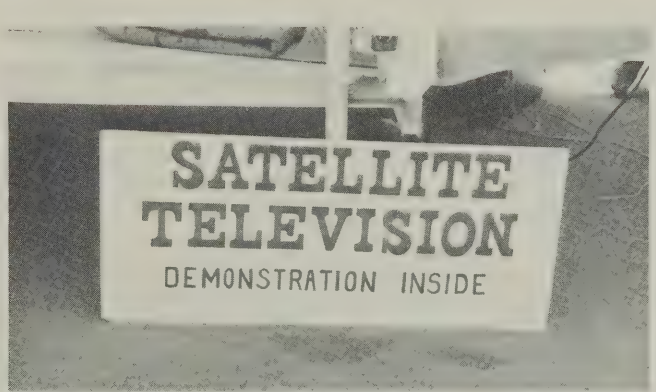
"I don't understand why some receiver designs have AGC while others do not. Do you need it? If not, why do some include it?"

Automatic gain control is only required when you have some stages in the receiver which are operating close to their maximum output capabilities with 'normal' inputs. Every active device (i.e. transistor) has an 'overload point'. That is, when you sum (add) the **input** voltage to the device with the gain (in dB) of the device, you must then determine if these two numbers added together will exceed the **rated output capability** for the device. If it is close but on the low side, you get concerned that somebody may use a 'hot LNA' or a 'big dish' ahead of the device, producing more input signal than was considered 'normal'. If this 'hot' input signal pushes the output of the device in question beyond its rated output (level) capabilities, the device may saturate (i.e. shut down), it may overload (i.e. produce distortion products) or it may start generating inter-mod (products created by the sum and difference of the various carriers present in the device). Any of these will cause the system to go into convulsions.

Some receiver designers choose to run their devices far enough below the output rating capabilities of any single stage that they know that no realistic combination of LNA gain plus antenna size is going to produce too big an input for any of the stages in the receiver system. Other designers choose to run some of their active devices in the 'upper portion' of their operational curves because often this is where the best operating characteristics are found. The danger in this is that the device can be overloaded and they therefore plan for this possibility by creating an AGC system that 'servos' backward in the receiver to cut the gain down in case there is an increase in the receiver input (RF) voltage levels.

Most of the commercial receivers AGC only in their video amp stages to insure that they maintain a flat 1 volt peak to peak baseband video output although a few do AGC in the RF protions (typically in the IFs) as well. Again, each design engineer has his own approach and if only one approach was best then that would be the one used by everyone.

As in all things in life, there are designing trade offs that must be considered with any approach to TVRO receiver design. A little bit of knowledge, as they say, is dangerous. Too much knowledge is perplexing sometimes!



SAYS IT ALL. Boy did we demonstrate!

PROGRAMMING CORRESPONDENCE

RCA ALASCOM NOTES

I would like to thank the Coopers for putting on the SPTS '80 San Jose Seminar.I found it a most worthwhile trip and very educational. The exhibits were great and the sessions outstanding. I especially liked meeting the people who design the equipment because it makes mail order transactions more personal. You did a great job of arranging everything and the San Jose Hyatt was a fine facility.

Here are some notes, from my Alaska based observations, concerning the present program feeds to Alaska on transponder 23, RCA SATCOM FII. All programs uplinked from New York City (via Vernon Valley) are carried with a standard 6.8 MHz aural sub-carrier. All programs uplinked from Los Angeles will have the audio on a 5.8 MHz sub-carrier whether the video signal is dual or single format (two video signals are transmitted in the half-transponder format). All programs uplinked from Anchorage will have the audio on 5.8 MHz. A SCPC signal with the same audio will also be used on transponder 3 with both the Los Angeles feeds and the Anchorage feeds to accomodate the older Bush Terminal sites which started off with a program audio system utilizing a transponder 3 SCPC channel. And just for the record, should SATCOM FII fail or go crazy (as it did once last fall) the backup satellite designated is ANIK III located at 114 degrees west.

Paul M. Yoshimi
Alascom Yakutat Earth Station
Yukatat, AK 99689

Thank you for the additional information Paul; and thank you [!] for coming to San Jose.

LIKED SPTS '80 SAN JOSE

After twenty eight years as a communications technician in Canada I can only say that I have never enjoyed a business seminar as much as I enjoyed SPTS in San Jose! Thank you very much; as usual it proves once more that we Canadians are indeed fortunate to have you as our neighbors. The warmth and friendship extended to me, a comparative no one, was beautiful. Each and every exhibitor was above all patient and indeed helpful. If I can be of any service to you at any time, you need only ask. You and your friends are remarkable people. I only wish Dr. Miesell of our CRTC and Mr. Fox of our federal government could have attended. I for one will spread the word and in that vein please list me in **CSD** as being anxious to share satellite technology with any and all in my area who might work together on such a project.

R. H. Cooke Communications, Ltd.
Box 401
Pitt Meadows, B.C. VOM 1PO
Canada (604-465-6835)

Thank you for attending! SPTS works very well because it has a spirit one seldom finds anymore; an openness and real world flavor which for some reason we seem to have lost in the day to day business world. Most of all it is informal and people coming quickly realize that they can let their hair down and get heavily involved the subject matter that attracted them in the first place. We hope you will come back and we'll do our best to keep the future SPTS events at the same pace. Oh yes - we have agreed to return to the San Jose Hyatt July 3, 4, and 5 in 1981 **so those who want to start planning now have a date to shoot for!**

EIRP CHARTS

Can you tell me where I can locate a set of EIRP footprint maps (11 in all I believe) showing the dBw signal contours for the various satlelites?)

Howard Goodyear
San Francisco, CA 94112

Several years ago Coop made up such a set of two-color maps [8½ by 11 inches in size] and they were available, at the time, **through CATJ magazine. No more. However Coop has prepared a new "Satellite Users Manual' which was available at SPTS '80/San Jose and it contains the latest footprint data for each bird of interest to us here. Footprint maps have appeared in past issues of CSD as well, and four representative footprint maps appear on the back of our popular Worldwide Communications Satellites wallchart.**

ACTIVE IN INDIA

We would be grateful if you could send us the publications 'Coleman TD-2 Manual', 'Howard Terminal Manual', 'Swan Spherical TVRO Antenna Manual' and 'Satellite Study Package' for our library.

N. K Sharma
Space Applications Centre
Government of India
Jodhpur Tekra
Ahmedabad, India

It's a deal if you will keep us advised of the development of the Indian Domestic bird system now under construction!

BIRD OPERATIONAL NOTES

New Russian Ghorizont bird (IV) at 14 west became active late in June; replacing ailing II bird previously in operation there. Outstanding +31/32 dBw Global beam carries five active TV transponders; details in September **CSD**.

Molniya reception has now been 'proven' on both coasts, Canada and Mexico. Next challenge!

VERY heavy use of Westar 3, COMSTAR D-2, Westar I plus limited use of Westar 2 and Satcom I during GOP convention had individual stations (more than 60) now equipped with earth stations in US feeding live reports via satellite. Many stations shared local PBS terminals (on Westar I) for receipt of their live 'via satellite' convention feeds. Economy of satellite made possible local flavor for coverage by individual state delegations. Much of this will repeat for Democratic convention.

Electronics trade press coverage of SPTS concentrated on pricing of hardware, large number of potential and actual

dealers and distributors on hand, and development of SPACE group program.

EXPANSION of cable services to COMSTAR D-2 and Westar III now seems certain. Major programmer supporting Westar is Satellite Syndicated Systems which operates SPN on transponder 21 of FI. They are offering actual package of ten foot dish plus Amplica 100 degree K LNA to legitimate cable systems for $2500 (system supplies receiver). Satellite Communications Network meanwhile is pushing larger (5 meter) terminals to cable firms for COMSTAR D-2 feed of SCN Las Vegas Entertainment Network due to begin service in September. Both programmers realize that if they are going to get big viewers for their programs (and therefore dollars for programming) they are going to have to provide hardware at cost or 'free' in some instances. Effect on TVRO hardware business may be tightening of supply of LNAs, some receivers and smaller dishes for the next six months to a year; from 'commercial' (i.e. cable) vendors.

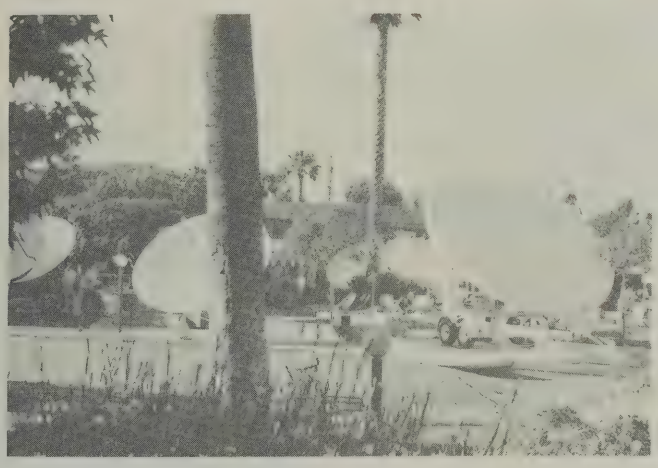
RCA reportedly **studying** feasibility of building, launching and operating a 12 GHz direct broadcast satellite (DBS). NAB meanwhile continues war of words against DBS concept zeroing in on regional or national nature of DBS service and arguing that if DBS is allowed to operate 'local station' service will suffer; may even disappear.

UN meeting of Committee on Peaceful Uses of Outer Space made no real progress during July meeting. Group was even unable to agree on site for next meeting. Bulgarian delegate set tone by urging group to adopt policy that propaganda broadcasts from satellites "especially those broadcasts that incite hatred" should be banned. Soviet position urged that 'sovereignty of states must be protected by agreement'.

OTHER DBS news: COMSAT now says it will file DBS plan with FCC by September or October. NTIA (5285 Port Royal Rd., Springfield, VA 22161) has issued study of potential interfereance between DBS system (12.2 to 12.7 GHz) and existing / planned terrestrial services; $6 and number is PB-80-157423. DBS as subject has been added to agenda of Public Service Satellite Consortium meeting this fall. Japanese DBS experimental satellite (BSE) quit in June after failure of third (of three) traveling wave tube amplifiers. Japan had planned experiment for another year or more but premature failure of TWTs indicates flight rating of 200 watt TWTs is still far ahead. PBS decided to **cancel** plans of direct satellite feeds to translators.

RCA got clean bill of health from FCC over squabbles involving RCA assignment of transponders. Litigants (SIN, others) may now try court appeals.

Winegard Industries Robert Fleming reports this major TV equipment supplier plans to be in home terminal business by October; representatives from Winegard including firm founder John Windgard were in attendance at San Jose.



ANTENNAS - as far as the eye can see. And this was but one of three antenna areas set up!

Satellite Program Network feed on Westar III (transponder 9) actually began before July 18th formal start date; Westar IV due to launch in 1982 will have 24 transponders (as does SATCOM and COMSTAR now) and SPN/SSS President Ed Taylor believes by the effective date of IV-use cable growth will be so substantial that majority of IV transponders will then be dedicated to cable programming services.

Don't get too hooked on San Francisco/Oakland KTVU (transponder 1 on FI); it will leave its 'super station' status on January 1, 1981 as the Warner Amex carrier replaces it with Nickelodeon (now on 11). Warner's **The Movie Channel** service will then expand to 5 and 11 with 5 utilized for west coast and 11 for east coast. The Movie Channel has been hampered outside of Warner owned systems where mandatory carriage applies because the 24 hour service brings up R rated movies at times many cable systems do not deem appropriate. By switching to a pair of transonders (one east, one west) The Movie Channel finally admits it wants to compete with HBO and Showtime.

White House ('the' White House) installing private terminal so President Carter can have direct access to Cable News Network and other services not available in DC. Ronald Reagan would probably like it there also; he can keep tabs on his old movies on WOR and WGN that way!

Westar III to be home for new AP Dataphoto service to newspapers; this is in addition to present leased line service where same end result is called Laserphoto.

Whether ARABSAT will ever get off ground continues to be a big question; consortium of 22 mideastern nations asked for bids on system and received only 1 taker. Group decided that wasn't enough to 'choose from'.

FCC and RCA under pressure over use of 132 degree orbit spot everyone has assumed would be home for SATCOM III replacement; due for late 1981 launch and operations. This Clarke orbit spot is considered 'prime' because from it all of US and North America can be 'seen'. FCC originally wanted to give RCA another shot at slot after loss of III last December; still believes RCA should have chance to fill it. Other competitors would like to convince FCC RCA **had** a shot at it and blew it; and **they want** FCC to reopen slot to first-get there, first to have it free for all.

Exact transponder line up (and exact birds to be used) by controversial Premiere package (see **CSD** for June, page P9) remains up in air. No firm announcements likely until mid-fall.

FCC approved Ted Turner's sale of North Carolina UHF station ($20M) and cable industry group of investors added $10M to help bankroll of Cable News Network. Turner has everything on line with this one.

Television stations not equipped with TVRO facilities during GOP gathering in Detroit were paying high bucks for access to a satellite feed. Examples: One station bought $3200 tuneable receiver for local PBS outlet to get use of PBS terminal for perhaps half dozen feeds. Another station was paying $400 per use and used terminal 3 times per day for five days. Anyone with trailer mounted terminal capable of quality reception from WESTAR birds could probably pay for trailer in a week by renting it to local TV outlet.

AUSTRALIAN direct to home service appears mired in studies. Recent COMSAT award of $200,000 for study of program is latest. Word from **inside** Australia tells us Australia will opt for 4 GHz rather than 12 GHz service.

INDIANAPOLIS area CATV operator Omega Communications installing $30,000 apartment house systems interfacing with existing MATV systems.

ESPN carrying 43 Canadian football league games; USA Network (formerly Madison Square Garden Events) now carrying professional soccer (transponder 9) Wednesday evenings. HBO Cinemax scheduled to begin 24 hour per day service transponder 20, 23 August 1st.

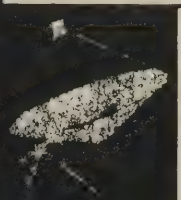
RCA back demonstrating and testing STRAP (simultaneous transmission of two video baseband signals on one transponder through interleaving of alternate lines of picture) and now professes system will be used in **international** transmissions (via INTELSAT) of programming for Armed Forces overseas. If system is employed for INTELSAT transmissions, use of US programming overseas will be out of reach of virtully all lower cost terminals since present generation of STRAP decoders are in $20,000 region.

ANYWAY YOU LOOK AT IT...

ADM HAS YOUR ANTENNA!

AND YOUR TVRO SYSTEM. Rapid delivery on ADM's super-efficient 11 foot polar mount antenna (includes remote controlled polarization rotation system as well!), plus, packages are available for complete systems including LNA, 24 channel tuneable receiver and cabling. Why wait in a long line when you can get the best, today!

A SUPER TVRO ANTENNA SYSTEM. High quality panelized aluminum 11 foot dish and steel polar mount. Dish weighs approximately 200 pounds, mount 265 pounds. Precision designed, easy installation, zinc chromate base primed and heavy duty white top finish. The rotating feed is standard! Easily shipped and installed. Choice openings for dealers and distributors.



Antenna Development & Manufacturing, Inc.

P.O. Box 1178
Poplar Bluff, Mo. 63901
(1-314-785-5988)

ALL AMERICAN TECHNOLOGY

THIS PRODUCT NO LONGER AVAILABLE!

ROHNER & ASSOCIATES introduces the Rohner Converting Video Receiver, the 'All American TVRO Receiver' of the future available today. First the price: **$1500**. Now the eye-opener: **LNA is included!** You get 15 programmable time over transponder microcomputer operations. You have automatic aural subcarrier search that begins with 6.8 MHz, moves to 6.2 MHz and then does a full search starting at 7.4 MHz working down to 5.5 MHz until an aural sub-carrier is found. Of course you are fully frequency agile (all 24 transponders) and with the TRI-STAR GENERAL rotator system your receiver commands your feed to the appropriate polarization; automatically. There is full AFC and AGC control, automatic. The output is on standard NTSC VHF channels 2, 3 or 4 (others optional). Outstanding performance with a threshold at 8.0 dB C/N. A built-in direct/satellite antenna changeover switch is provided. The satellite receiver of the future is here today.

R&A

Rohner & Associates
501 N. Elm
W. Liberty, Iowa 52776 (319/627-4819)

Sat-tec THE LEADER IN LOW COST TVRO

Introducing the R2 Satellite Receiver

A TV Satellite Receiver with all the features you need, at a price you can afford.

The Sat-tec R2 receiver is a versatile, consumer oriented unit designed for volume production. Easy operation and a clear, simple format makes the R2 idea for any application where non-technical users are involved. Fully frequency agile, the R2 may be used on 12 or 24 transponder birds, and since the tuning is continuous, foreign satellites such as Intelsat and Molniya can be received. A high performance AFC keeps the tuning accurate and sharp, fine tuning is not necessary. Standard one-volt P-P outputs for both audio subcarriers as well as video interface easily to any VTR or use the optional BC-1 modulator for direct TV set hook-up.

For a quality, low cost TVRO system, the Sat-tec R2 receiver can't be beat!

SPECIFICATIONS

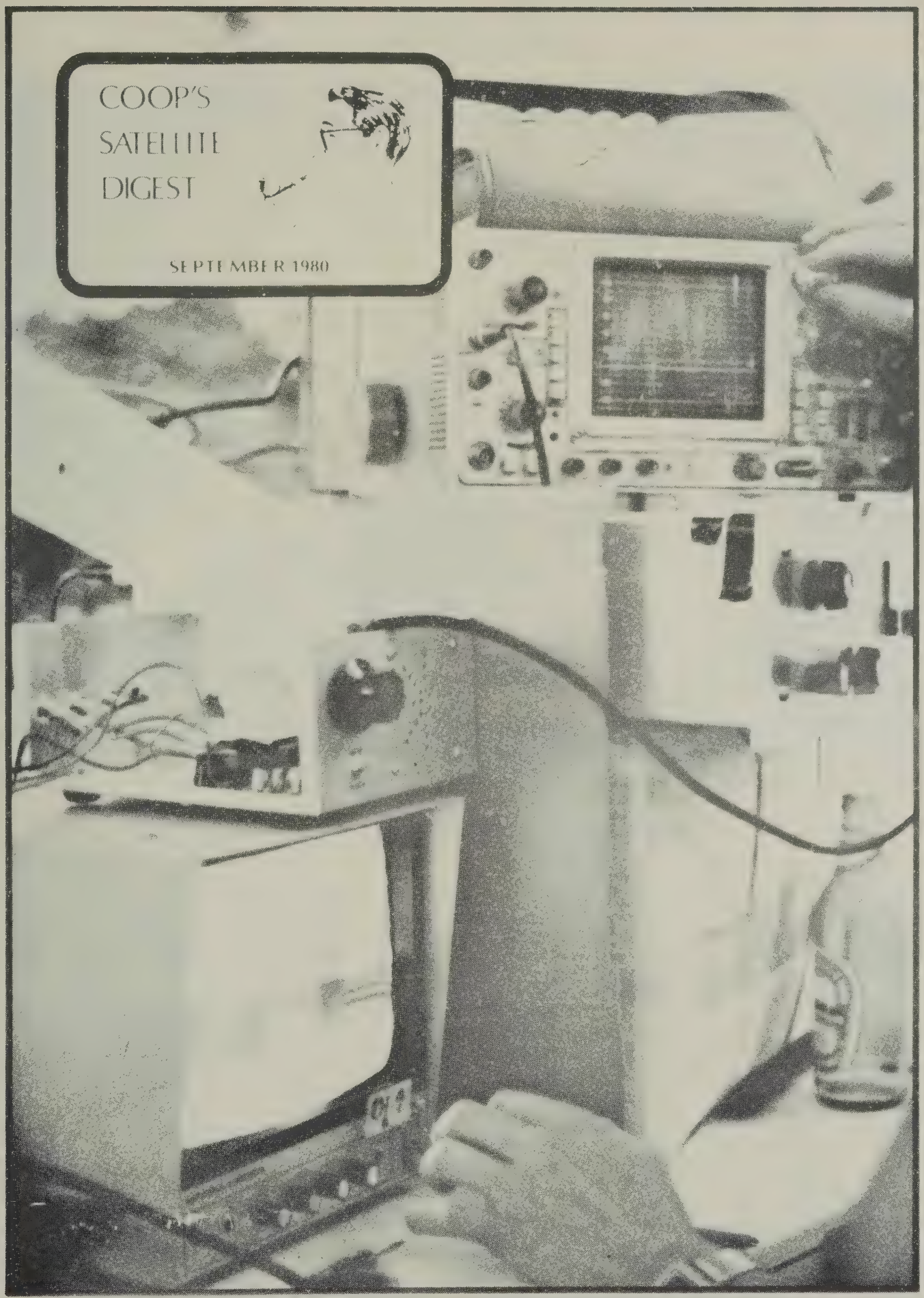
Frequency Range:	3.5 - 4.5 GHz
Noise Figure:	12 dB, a 120° K 50 dB LNA and 10' dish provides good quality reception for most of USA.
Audio Subcarriers:	6.2 and 6.8 MHz standard, others available.
LNA Power:	15 volt at 150 Ma LNA Supply built-in.
Power Required:	110 VAC at 15 watts 50/60 Hz, 220 volt available.
Size:	8 x 6 x 3 inches, 3 lbs.
Price:	$995.00, completely wired and aligned; one year warranty.
Optional:	BC-1 RF Modulator Kit, tuneable channels 3-6 with sound....$24.95.

Sat-tec Systems

Penfield, NY 14526 • 2575 Baird Rd. • 716-381-7265

COOP'S SATELLITE DIGEST

SEPTEMBER 1980



LET'S TALK PRICE AND PERFORMANCE -

Manufacturer to Dealer/Distributor.

Becoming a 'dealer' in home TVRO terminals seems pretty simple. All it takes is several thousand dollars of your money to buy a trailer mounted portable rig. Unfortunately that's where many of the suppliers stop treating you like a dealer; they take your money, deliver to you a trailer equipped with antenna, feed, receiver, LNA and some cables and they send you off down the road. **STS of Missouri** believes there are enough 'wrinkles' to this new business to require more of an effort than that. And that is why we go the extra mile to get a dealer really up and running. **We train you.** Not in just how to make the trailer rig play, but in the fine points of showing off various satellites, what to emphasize **and** what to avoid (!). We know from experience 'how to sell' home terminals. We teach you this because we feel you don't really become a dealer **until you start selling** systems to others. And that brings us to pricing. There are plenty of trailer mounted rigs around and you can spend $7500 or more to get started as a dealer. We believe the trailer rig needs to be priced low enough that **you can afford** to become a dealer. That's why we price our complete 10' high quality trailer rig thousands of dollars below what some others sell for. The trailer rig is like a camera...with it **you will sell** dozens or even hundreds of complete systems. And just as the camera owner keeps coming back for film, you will keep coming back to **STS of Missouri** for complete home terminal packages. It is just as simple as that...we are 'bottom line' conscious; **your bottom line** because we know the name of the game is profit for you. All **STS of Missouri** home systems (from our 10 foot panelized antenna system that breaks the 'bird-bath-looks' barrier to our big, rugged 13 foot solid dishes) are quality; from the ground up. And while we provide **complete** systems (including modulator, all cables and fittings; ready for you to install and hook up directly to the user's TV without any 'funny part' hassles), at **STS of Missouri** you can also buy just the parts you need! REMEMBER - your future as a dealer will only be as good as the integrity and strength of your manufacturer. **STS of Missouri** has the 'winning combination' of good looking antennas plus completely packaged home receiving systems that bring a new dimension to quality; reasonable pricing. So join up today with 'The Good Looking Team' at STS of Missouri where as a dealer you get far more than a trailer mounted antenna and a hearty handshake.

STS OF MISSOURI

P. O. Box 1181, Poplar Bluff, MO 63901
Call toll free 1-800-325-0761 outside of Missouri;
inside of Missouri call 1-800-624-0851.

Lindsay ○○○

Provides the way for visibly better pictures from your Satellite Antenna

Lindsay model LS9-35

JUST CHANGE OUT YOUR PRESENT FEED HORN TO THE NEW...

model LS9-35

Lindsay

CIRCULAR SCALAR STYLE, HI-EFFICIENCY FEED

To assure optimum results on new systems, use it from the start !

THIS IMPROVED CIRCULAR FEED INCREASES ANTENNA PERFORMANCE FROM 50% UP TO 70% BY BETTER DISH ILLUMINATION.

IT IMPROVES YOUR RESULTS BY PROVIDING .5 TO 1.5 dB MORE GAIN TO THE LNA. THIS DOES MARVELS TO THE TV PICTURE.

DEALER ENQUIRIES INVITED

The Lindsay LS9-35 is all brass construction with smooth transition from round to rectangular flange:
Easy and Fast to install. BUY THE BEST...
WE ARE THE BEST BY COMPARISON !

Introductory Offer

ASK FOR THE LS9-35	USA $	CAN $
1 – 3 Units.....	$145.00	170.00
4 – 10 Units.....	135.00	158.00

WE WILL DELIVER ANYWHERE IN CONT. U.S.A. and CANADA
Please, send cheque or money order now to:

Lindsay Specialty Products Limited
50 Mary St. W., Lindsay
Ontario, Canada K9V 4S7 Tel. 705-324-2196

COOP'S COMMENT ON TECHNOLOGY

SURPRISE - Houston Is On!

Immediately after we got home from San Jose I sent out a letter to all of the 30 + equipment exhibitors who appeared at San Jose asking for their thoughts on what **we** did right and wrong there and how we could make future seminars more enjoyable for them. We also asked them to help us plan when the next seminar should be held and gave them several alternatives which we had been considering. Frankly we were tired and felt that after they got home and got off the 'high' of selling out wall to wall their entire production for the next several months (at San Jose) they'd want to catch their breath as well.

Well surprise. With 70% of the exhibitors commenting in ten days time there were fewer than 15% who said they didn't want to have another seminar **this** fall! Apparently seminars get into your blood stream and just won't let go. I know they are fun (for most people) but I honestly felt three per year was pushing it. "**Not so**" said several exhibitors "**by scheduling them about four months apart you are pushing** us **to keep coming up with newer technology and new efficiencies...and we think this is good!**".

OK. The dates are November 17, 18 and 19. The location is **The Adam's Mark Houston** hotel, a facility that is not even yet open (it is that brand new!). There is 15,000 square feet of exhibit space, a super new facility with tennis courts, saunas, what is called the best eating restaurant group in the southwest about a block away and a brand new MATV system (those who were in San Jose will appreciate **that**).

There are some changes. We are calling this fall gathering the '**Satellite Business Opportunities Conference**'. And we are changing the format slightly because one solid message I got from San Jose is that more and more people coming to these gatherings are there primarily because they want to get into business, in satellites, in some fashion. OK - I promise we are not going to ignore technology at SBOC (there is no way to ignore it or even discount it since this is what is making us all move so fast) but the emphasis is going to be on entering the satellite systems business at some level and making a living at it. There will be big emphasis, in our live lectures, on being a dealer or distributor in this field. Everything from employee training to trouble shooting customer terminals will be included. We will also have sessions on uplink terminals, how you can make money with them, and even programming on the satellite and making money as a program original source.

There will be plenty of exciting new technology for everyone; even newer receivers, possibly an Umbrella antenna with a receiver and LNA built in (!), a new 150 pound 10 foot antenna-mount-feed that can be shipped UPS, and much more I will tell you about as we get closer to the November dates.

I am convinced we are on the verge of mass merchandising of private satellite terminals. Very-very close. I have Watkins Johnson telling me that by November first they will be able to deliver several thousand VTOs per month. I have Bob Luly telling me that he will be able to deliver hundreds of antennas per month in the Umbrella fashion by then. I am starting to hear rumbles about another LNA price drop. There are lots of smoke signals out there and with the fantastic growth of satellite programming services now taking place in the cable industry, those firms out selling systems to commercial establishments such as motels, hotels, clubs, apartment complexes and the like should be having a field day.

Now let me assure all of our loyal SPTS fans that SBOC is **not** a sign that we are changing the rules here. **Quite the contrary** - the innovation that we get at an SPTS plus the one on one exchanges between technical innovators is I believe one of the primary reasons this industry is growing and developing so rapidly. What I am trying to do is to split the year up so that each spring (starting in 1981) in say the Chicago area in late March or early April (right after it finally warms up) we'll have a 'regular' SPTS event. Then over the 4th of July weekend (sorry Tay!) an annual west cost 'regular' SPTS event. Come the fall, in Houston if we like what happens there this fall, a 'modified' SPTS event under the flag of a business opportunities conference. This will allow us to broaden out a little, move in on the areas we have neglected to date (including cooperative programming ventures and low cost uplinking for some of the smaller nations of the world) and generally put the same talents who have revolutionized low cost **receiving** terminals to work solving some of the other 'expensive areas' now slowing down satellite growth world wide. I can see a $25,000 portable uplink terminal on our horizon...if I can just get some people like Taylor Howard and Robert Luly pointed in that direction. **SBOC '80 will be a start in this direction** and to that end I invite you to attend. **Registration card appears in this issue!**

OUR COVER

The 'San Jose' SPTS story in a picture. Moscow on TV, a make-shift table piled high with equipment rounded up from exhibitors and participants and an empty bottle of European refreshment. A clever Californian decided to see if he could use a 'scope filter to catch and drag out the 3.5 microsecond Molniya PWM audio; sure enough there it was with program audio!

CSD TECHNOLOGY

COOP'S SATELLITE DIGEST (Technology Section) is published monthly by Robert B. and Susan T. Cooper doing business as Satellite Television Technology (STT). Editorial offices located at West Indies Video, Grace Bay, Providenciales, Turks & Caicos, BWI. Communication with editorial office is through Business Office at P. O. Box G, Arcadia, OK 73007 (405-396-2574); Rick Schneringer, Manager. Photography, Kevin Paul Cooper; editorial assistance Tasha Anne Cooper. STT produces various manuals, videotapes, guides and texts plus conducts the twice annual SPTS and once-annual SBOC events. STT is not affiliated with any manufacturer or distributor of satellite communications equipment. **CSD** subscription $50 per year US / Canada / Mexico; $75 elsewhere. Total contents copyright 1980 STT, USA & Turks and Caicos.

WRAPPING UP SOME LOOSE ENDS

TIE IT ALL TOGETHER

We left several loose ends dangling in our July **CSD** report on Molniya as well as our brief mention in the August SPTS San Jose report concerning an apparent problem with the Sat-Tec R2 receiver. Given the period at the end of July to get back down to some lab work we can now sort all of this out and put to rest some rumors about both the R2 receiver and the Monlniya audio recovery problems.

As readers and viewers of our STT videotape (**'They Call This Bird Molniya'**) are aware, we conducted most of our serious work on Molniya utilizing a prototype Sat-Tec receiver. Our unit may well have been the first production unit to leave the factory, and we antitipated some changes and perhaps even problems since one only learns by doing the same thing over and over again. Our July issue report on the R2 said we found the receiver to have as much video sensitivity (on Domsat signals) as a well known $7,000 radio although we found the audio sensitivity on the more expensive unit somewhat better. In answer to queries **the** $7,000 receiver is the Microdyne Model 1100 TVR (VT); an older model no longer in production but very popular with the early CATV system users back some four or five years ago. Our unit is serial number 48 and it has given us good service for more than three years now.

August issue readers noted that we had found a baseband noise problem with the R2 receiver which we had overlooked previously; actually Steve Birkill was the first to spot it while here in mid-July and we were jointly hooking up his latest version of the Pulse Width Modulation detector system to try to recover Molniya PWM audio.

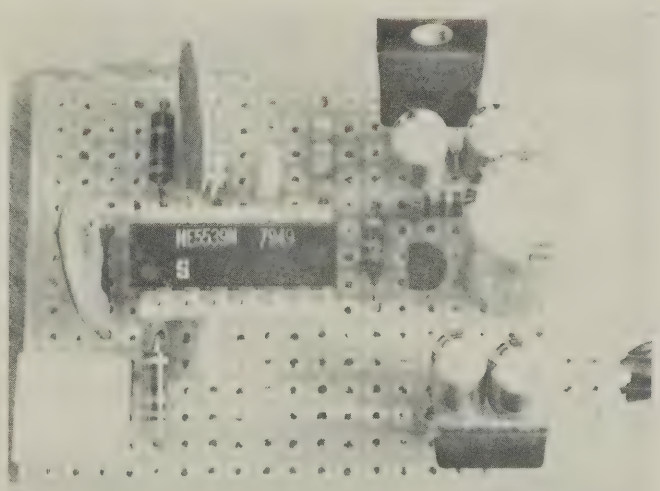
Our first inclination, spotting that the video information coming out of the R2 was badly tilted towards the chroma end (high end) of the baseband passband, was to call John Ramsey for help. John did not act too surprised and in fact commented that this was one of the choices a designer had to make when he got the user price down under $1,000, and, was also married to a PLL type detector. He suggested he would send us a 'fix' however. And within days a small package arrived with a single IC device tacked on a board with about two dozen other parts.

At this point we decided to trot the Microdyne 1100 TVR (VT) and a Microwave Associates VR4 (another $7,000 receiver) out to the Molniya test station. We figured that neither of these expensive receivers would have any trouble with baseband noise and that we ought to be able to 'grab' or 'gate' out the PWM pulses from their video output with ease; using the newest version of the Birkill PWM demod. So a day of testing and comparing ensued; with the 11 foot ADM dish equipped with a Birkill right hand circular feed and a 100 degree LNA, we wired up first one receiver and then another.

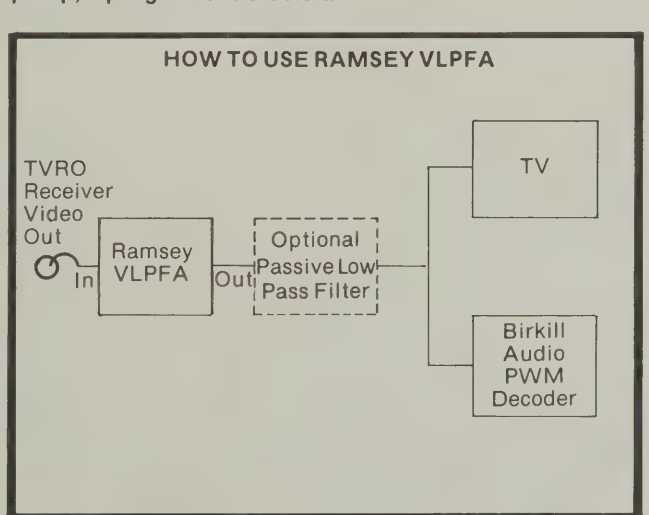
The results were disappointing. Those who saw the San Jose reception of Molniya may recall that utilizing an ICM 4300 or a Sat-Tec R2 receiver the picture was virtually identical to the eye; some grain appearing and depending on where you had the variable tuning set either black sparklies or white sparklies. We also saw in San Jose that the AVCOM PSR-3 receiver produced the picture with the **least** amount of sparklies but the picture had horizontal streaking in it. You sort of decided whether more sparklies and **no** streaks, or streaks and **less** sparklies was your preference. (Interestingly enough virtually everyone there opted for the less sparklies with horizontal streaks picture!).

The 1100 TVR(VT) and the VR4 looked like the PSR-3. That is, less sparklies than the R2 but horizontal streaking. And between the pair of $7,000 receivers the 1100-TVR(VT) had fewer horizontal streaks. Our April issue talked to the matter of the horizontal streaks and it might be a good idea to re-visit this subject briefly again now that Molniya watching is fashionable.

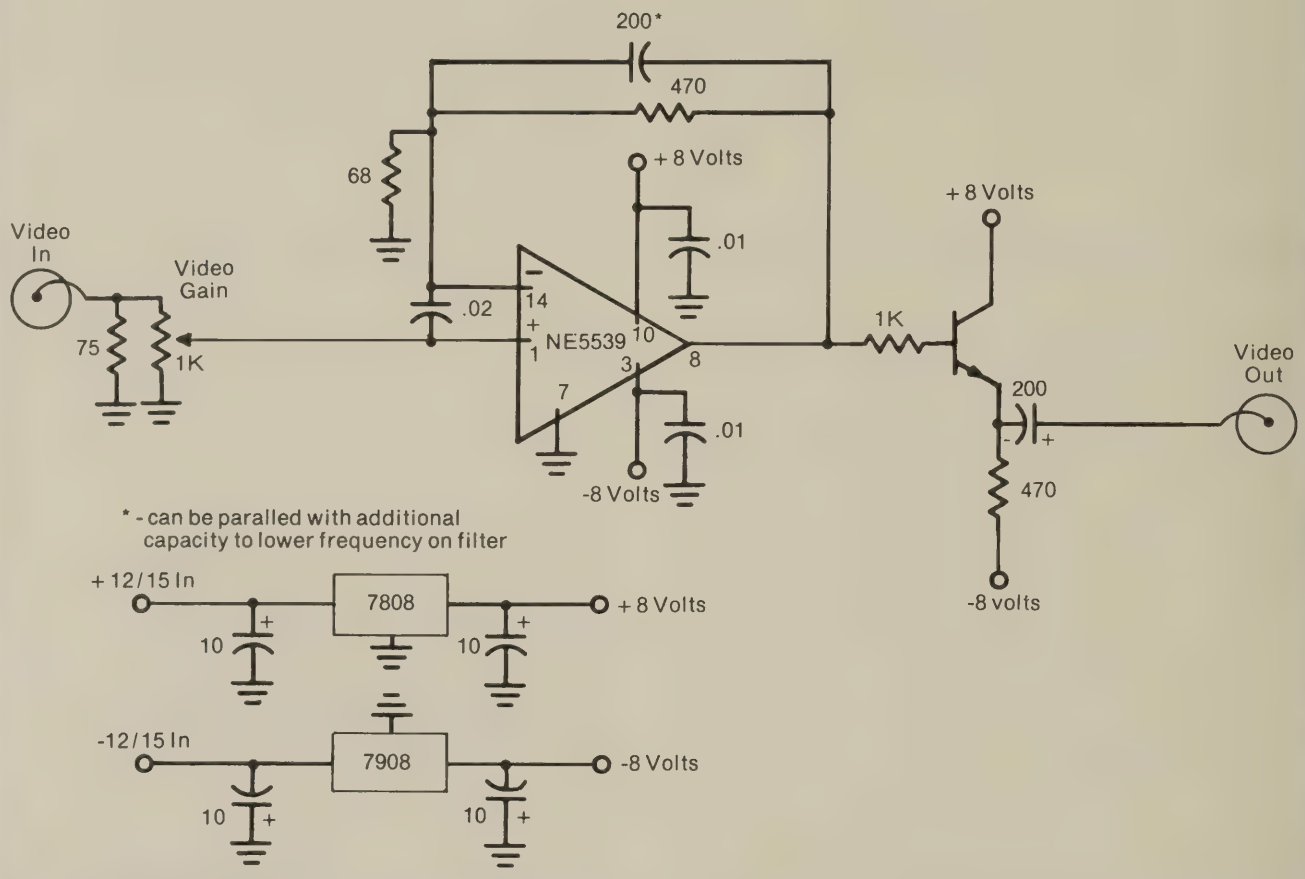
The Russian SECAM color system uses a line-rate rather than our NTSC one-per-field phase identification system. Our more expensive receivers use a 30 Hz energy dispersal clamp that acts on the back porch portion of the video signal. In the Russian waveform we have a pair of audio pulses which are not found in the American (NTSC) signals. The second of these pulses can (and will) fool the clamp; it looks like a part of the back porch signal to the clamp. When you tune in Molniya which combines SECAM color with the PWM pulses on such a receiver the presence of the second (last in time) PWM pusle 'modulates' the clamp and produces horizontal streaking in the picture. The irony of all of this is that the Russians do not even bother to have 30 Hz energy dispersal dithering on Molniya since they are not concerned about interfering with terrestrial



RAMSEY'S VLPFA DEVICE - Signetics NE 5539N high speed op amp; input gain control at left.



RAMSEY VIDEO LOW PASS FILTER AMPLIFIER [VLPFA]



microwave systems in the first place! But the receivers built for our standard do have the clamp built in and the unusual PWM pulse system triggers it causing the streaking.

One solution to this problem is to dis-able the 30 Hz clamp circuit in a high dollar commercial receiver. This is usually more complicated than it sounds however since a clamp by-pass system has to be added to the receiver and it may not be worth modifying a high dollar commercial receiver for this purpose for the occasional look at Molniya. **There are two other solutions.** One is to forget the Russian sync and blanking signals altogether and create and re-insert at the receiver totally new sync and blanking. This is the approach taken by Steve Birkill in England. The other solution is to clamp on a different part of the signal; the original Tay Howard receiver (as detailed in his Manual) clamps on sync pulse tips with a simple diode and capacitor that simply carries the 30 Hz energy to ground. It turns out that most of the home/private design receivers constructed subsequent to the Howard receiver Manual publication have followed Tay's approach to clamping the (usually present) 30 Hz energy. Back to the San Jose Molniya reception on both the ICM and Sat-Tec receivers; you didn't see any horizontal streaking in those pictures.

But you did see some grain that was not apparent in the AVCOM receiver. And since most people seem to object first to grain (noise) and second to streaking (modulation of the clamp by the PWM second pulse) perhaps a better ultimate solution would be to clean up the noise!

Well, finding that we were not really getting ahead by tieing the Birkill PWM decoder to the 1100-TVR (VT) or to the VR4 we were anxious to see what John Ramsey's 'fix' might be. It is shown here in schematic form. As you can see, it installs after the output of the R2 receiver; between the receiver and your monitor (or RF re-modulator). John calls it a 'Video Low Pass Filter Amplifier'. The major single active device is a signetics NE5539 high speed OP amp.

Tired of having sixteen trillion patch cables and clips leads laying out over the work bench during Molniya reception we installed both the Ramsey '**VLPFA**' and the Birkill PWM decoder into a suitable Bud box housing with a hefty power supply. The Birkill PWM decoder as shown requires a well regulated 12 volts (positive) while the Ramsey 'VLPFA' has to have + and - 12 volts; and regulation doesn't hurt anything. Internally in the 'VLPFA' John has 8 volt regulators for + and - 8 volts to the NE5539.

Along the panel of the Bud box we installed a set of jacks so that we could do quick switching between [**1**] feeding a TVRO video input directly to the Birkill PWM decoder, or, [**2**] feeding a TVRO video input directly to the 'VLPFA', and then by quick connect cables either route directly to a monitor **or to** the PWM decoder **after** the 'VLPFA'. In this way we could insert any segment of the pair of gadgets alone or any combination of the two (with an external video lowpass - passive - filter which is detailed on page 41 of the Washburn Manual). Here are the results of all of this:

1)**VR4 receiver 'barefoot'** (i.e. alone) - Molniya reception had a minimum of sparklie noise and the 1 MHz tuning

MOLNIYA on barefoot R2 receiver

MOLNIYA AFTER VLPFA processing through R2 receiver

steps possible with the VR4 make it easy to get right on the 3875 MHz center frequency. The clamp modulates badly with the Russian audio pulse however and horizontal streaking is intolerable. Audio recovery with the Birkill unit fed directly remains noisey.

2) **1100-TVR[VT] 'barefoot'** - Molniya reception had slightly less sparklie noise than with VR4 and far less horizontal banding. However horizontal banding was still objectionable. Molniya audio about the same as with VR4 (noisey) when fed directly into Birkill PWM decoder. By feeding receiver video into 'VLPFA' and then feeding Birkill PWM decoder, horizonal streaks improved slightly and audio improved slightly. Picture still not good quality and audio would be difficult to understand even if you speak Russian.

3) **R2 receiver 'barefoot'** - Molniya reception had objectionable noise content and audio could be barely found (i.e. detected). This was the problem mentioned in the August **CSD** notation that led us to go back to John Ramsey in the first place. Running the video output into the Ramsey supplied 'VLPFA' made a **dramatic difference** in the picture quality (see photos here). Picture quality was equivalent or better than best quality Microdyne reception. The audio system produced the 'best' 'audio' we have heard from Molniya although to be totally fair it remains noisey and is not pleasing to listen to. But, a person who speaks Russian can understand what is being said and having audio that matches the video increases the Molniya reception enjoyment by perhaps 100%.

The improvement of the R2 receiver with the 'VLPFA' in the line is difficult to describe without sounding like we are hyping the performance noted. Let's just say that we will **never** use our R2 receiver again (even on domestic signals) unless we are running the output through the 'VLPFA'. We would urge anyone who has an R2 or is thinking about getting one to do likewise; you can build up the 'VLPFA' from the schematic shown here and while we mounted our board in an external case because of our patch-cable considerations, it could be installed internally in the R2 if you could figure out a way to get both positive **and** negative voltage for it from the positive-only power supply in the R2.

Since this is the last time we **expect** to visit the Molniya reception situation in any detail there are some additional observations which are worth passing along. You must keep in mind that Molniya video is not directly compatible to US NTSC video; you already know that your vertical height adjustment must be re-adjusted downward to bring the picture (which is

MOLNIYA on barefoot R2 receiver

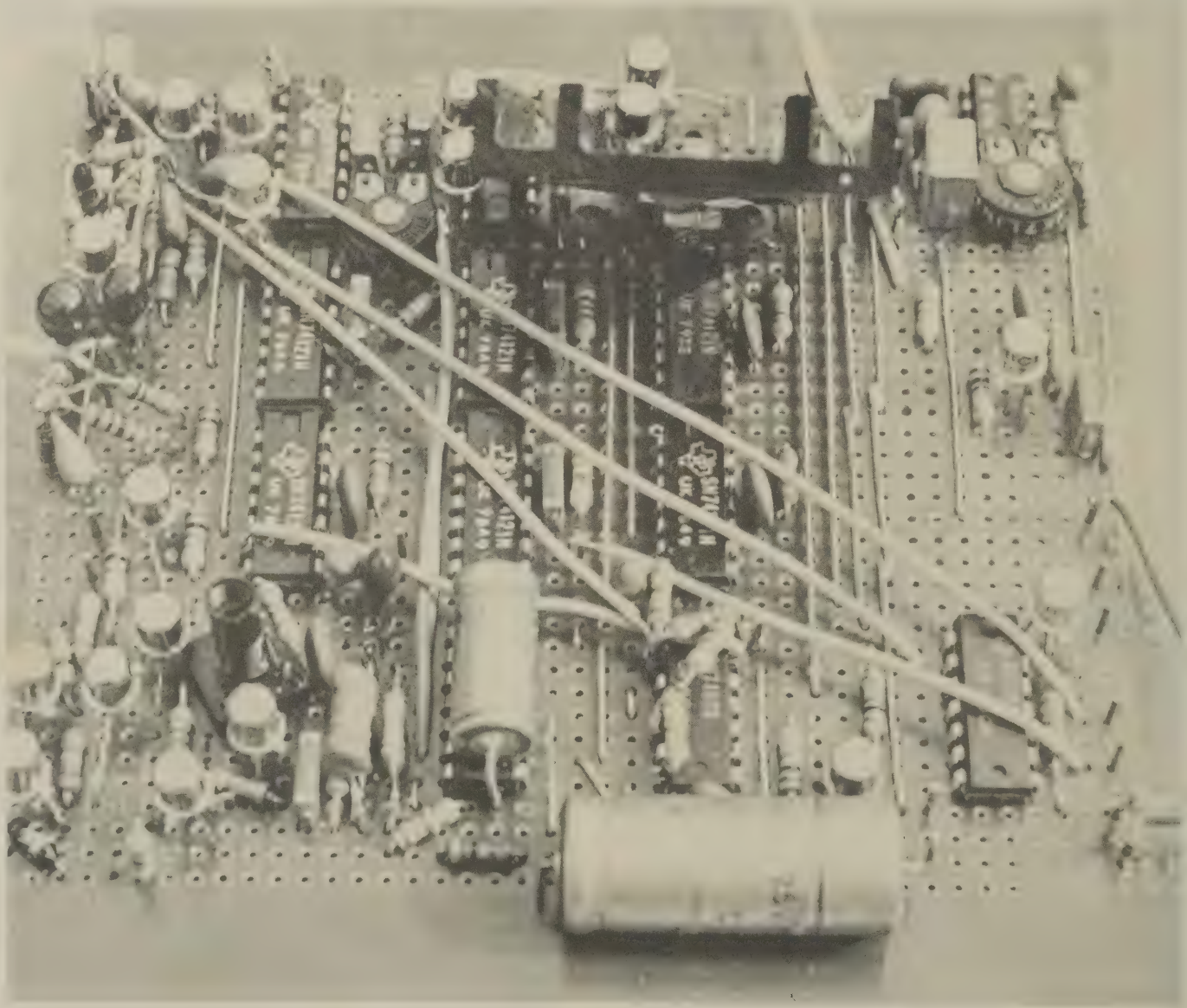
MOLNIYA AFTER VLPFA processing through R2 receiver

17% 'taller') down onto an NTSC screen. The 50 Hz derived sync signals with Molniya (and the new Ghorizont bird detailed elsewhere in this issue) are 'strange' to the NTSC monitor and the presence of the two extra Molniya audio pulses (plus a third pulse that reaches white level stuck **between** the two Molniya audio pulses for some unexplained reason) in the horizontal blanking interval can trigger instability in some monitors. The word **'some'** is key here; we happen to have around a dozen straight video monitors and monitor-receivers available for trial and we found by simple process of elimination that a Setchell Carlson model 10M915 and a Conrac model CVB17 (both black and white) monitors produced the most stable pictures out of our collection of monitors. (We even tried to run the Molniya video into a Sony KP-5000 big screen TV which considering that big screen TV is a 'western' phenominon may have been the first big screen display of Russian TV in the history of mankind!) Some (GBC, etc.) black and white monitors produce **absolutely terrible** Molniya video; they just cannot handle the extra signals or the fairly wide baseband (video) bandwidths. Bottom line? Be prepared to do some monitor swapping with Molniya. You too will be amazed at what a difference the right 'monitor' makes.

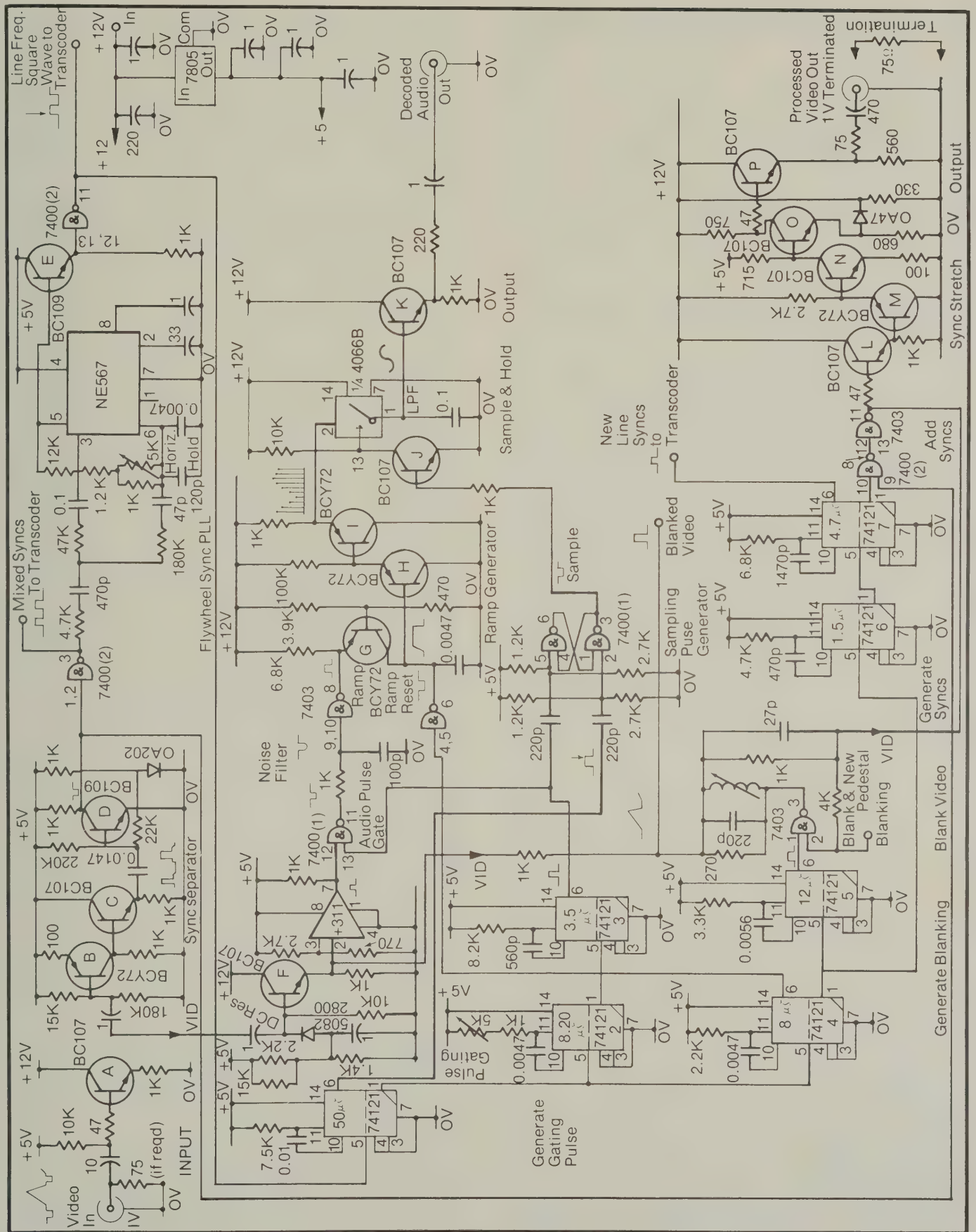
Numerous people have taken the demodulated video out of their TVRO receiver and run it into their Betamax or VHS recorders. You cannot **record** directly Molniya video but you can use the modulator built into a recorder to get you back on a NTSC RF channel. We tried it on various VHS and BETA machines and found they all worked pretty much the same; i.e. OK. If you happen to be working with the new Ghorizont bird which has standard audio subcarriers you can carry the audio along with you too.

Birkill PWM Decoder

We have reached the conclusion, after testing and talking with Steve Birkill at some length about the problem, that recovering high quality Molniya PWM audio **can be done** utilizing the new circuit shown here. This is the unit Birkill built up for us late in June, shipped over to us and then worked with us while in Oklahoma in mid-July. **BUT** - recovering **good quality** PWM audio requires far more signal (RF at 4 GHz) than we could get out of the sky with an 11 foot dish. Extrapolating our own audio signal to noise ratio and our video CNR ahead to the point where we could reasonably expect totally noise free



BIRKILL LATEST VERSION OF PWM AUDIO decoder system per schematic diagram here. We found the 1 volt P-T-P input adjustment requirement critical and by balancing gain control on Ramsey VLPFA and 500 ohm pot across input line to Birkill decoder we were able to clear out most of the background noise and sync pops.


Line Freq. Square Wave to Transcoder
+12V In
Com
Out
In 7805 Out
OV
+5
+12
220
Decoded Audio Out
Output
Mixed Syncs To Transcoder
Flywheel Sync PLL
NE567
BC109
BC107
BCY72
BC107
4066B
LPF
Sample & Hold
Ramp Generator
Ramp
Ramp Reset
Sample
Noise Filter
Audio Pulse Gate
Sync separator
Video In
INPUT
(if reqd)
DC Res
Pulse Gating
Generate Gating Pulse
Sampling Puse Generator
Blanked Video
New Line Syncs to Transcoder
Add Syncs
Sync Stretch
Processed Video Out 1V Terminated
Termination
Blank & New Pedestal
Blanking VID
Generate Blanking
Blank Video
Generate Syncs
VID
Horiz.
Hold

VIA CABLE - Your One-Stop Source For Complete TVRO Dealer Packages!

QUALITY home terminal packaging begins with the selection of high quality component parts. The TEXSAT Division of Via Cable brings to the home terminal world the experience of nearly five years in supplying high quality, cost-effective terminals to the cable television industry.

NO TWO home terminals are alike. That's why our TEXSAT Division stocks in depth a full line of 3, 4 and 5 meter fiberglas dishes including mounts, rotating feed systems and for the super sophisticated system dual-button hook feeds with orthocoupler. AND we also stock in depth a full line of the best components and hardware in the field today; devices and units field proven through years of satisfactory use by cable television systems coast-to-coast. FOR example - TEXSAT carries 120 degree Avantek LNAs, Microdyne 24 channel tuneable receivers (and there is no finer receiver available in the world today!), Blonder Tongue professional grade modulators, Heliax® and 214 cable sets and connectors. AND we also stock handsome customized cabinets for all of the inside equipment to give the ultimate user a system that not only works to state-of-the-art but is pleasing to look at as well!

AS A DEALER you need to ask us about our TEXSAT Package VIII - a special dealer package that includes a 3 meter dish with rotating feed mounted on a single axis trailer, a 120 degree Avantek LNA, a Microdyne 24 channel receiver and 100 feet of cable!

IF low-grade home terminal equipment is eating up you profits as a dealer, or if you simply want the back-up of a trained, professional staff that has been installing terminals for over five years, check us out. We've got the equipment and experience to make you profitable!

VIA CABLE INCORPORATED

P. O. Box 552
Ingram, Texas
78025
512-367-5714

video and audio we feel that anyplace in North America you will require a **16 foot dish** equipped with a right hand circular (RHC) feed and 120 degree Kelvin LNA to get noise free video and audio under all conditions.

Additional Molniya observations tell us that there is a signal variation of perhaps 1 to as much as 2 dB from the bird while it is operational. Most observers seem to agree that the strongest signals are typically when the bird is either going into apogee, or, towards the end of the active period when it is coming out of apogee. There are two possible explanations for this:

1) **The bird is closer to most of us** when it is first turned on, **and**, just before it is turned off. That is, when it is closest to the US/Canadian border rather than when it is over Mansel Island at apogee (See **Coop's Satellite Operations Manual** from STT). The closer it is to us, the less the 'space' or 'path' loss and this can amount to a part of a dB anyhow.
2) **The bird's Global beam pattern** may have some ripples or ridges in it. We have noticed however that each of the four birds in the 'train' follow pretty much the same pattern for signal strength (although recently the bird switching on around 2300 GMT does seem to be perhaps a dB stronger than the other 3).

The slight 1 to 2 dB difference in video signal quality is measureable but not really noticeable unless you have a very marginal system to begin with. However - you can really tell the difference in the audio quality when the carrier level changes by perhaps 2 dB. Those 3.5 microsecond pulses which you have to 'gate' out of the horizontal blanking interval and recover for demodulation to audio are tricky little fellows that do not like noise of any kind. There seems to be a 'threshold' effect here just as you have with FM video.

The new (and we 'stamp' suitable) Birkill PWM decoder shown here is a later version of the system described in the April and May issues of **CSD**. To understand the theory behind this circuit we refer you back to those issues of **CSD**. There are only four builder-user adjustments:

1) **Input voltage level** (video) must be 1 volt. We placed a 500 ohm pot across the receiver video line to the PWM decoder and adjusted this level for best sounding audio (very-very close to 1 volt typically).
2) A SECAM 4.43 MHz color sub-carrier trap.
3) **A pulse-gating window control** (pot) with which you search for the optimum placement of the gate atop the 3.5 microsecond pulse carrying the audio.
4) **A 'horizontal hold' control** which is adjusted for maximum horizontal stability on the video picture (just like on your TV set).

Some observations about using this circuit. The more noise you have in your video, the harder it will be to recover adequate audio. And the tougher it will be to properly 'balance' the (1) input voltage level adjustment, (2) pulse-gating window pot. You do have to work back and forth very carefully. At the same time you should have the TVRO receiver adjusted for an equal balance between black and white sparklies (assuming you are not totally out of the noise). To **initially** set it up, run the video level pot down (**below** 1 volt) to about .75 volt, tune the receiver ever-so-slightly into the white-sparklie region and then adjust the gate-window pot. Once you start hearing audio bring the video level up slightly (to around .85 volt) and re-adjust the gate-window pot. After peaking that re-adjust the TVRO receiver for best balance between black and white sparklies and bring the level up to a full volt readjusting the gate-window pot one more time.

The Birkill gadget does work very well but again this caution; if your video is not at least to the quality you see here in our photos, you are wasting your time going after the audio (unless you just want to see if you can do it) as the audio will be noisey and not pleasant to listen to.

Conclusion

Watching the Russian / Moscow Olympics on Molniya was quite exciting. Seeing the events on Russian TV a day or more **before** film footage of the same events reached the US was intriguing and comparing the Russian video of the events to the US or Canadian coverage was educational to say the least. Future Molniya reception will be just as exciting for

those who have never previously watched Russian television but for those who have now done it there will be new challenges in the sky to conquer!

Finally this observation for those who might build up the Birkill PWM decoder as shown in this issue. We took the opportunity while Molniya was on test pattern to carefully adjust the PWM gating pot as well as the 1 volt video input level (which must be precisely set). We found it much easier to adjust to the Russian 3 Kc audio test tone than we did to adjust to programming since programming audio levels vary widely. We had the neatest sounding 3 Kc test tone you could imagine; it was loud and clear from 50 feet away. We also took this opportunity to check the PWM audio tone pulse on the scope and sure enough there on the first vertical trace was the 3 Kc (or KHz if you are not old fashioned!) trapezoid pattern. The second (to the right) pulse was a straight line; no audio present.

Then when programming started we cranked up the volume...and there was nothing there! Just sync buzz garbage. Back to the scope and sure enough the Russians had switched PWM channels on us! Subsequent checks revealed that this is apparently standard practice; **run a test tone on the first pulse** when the test pattern is up but carry **program audio on the second** (furthest right if you see it hanging along the right hand edge of your TV screen) PWM channel. In our system the Russian audio on the first pulse is **far cleaner** than on the second pulse; but to date on this pulse we have heard **only** the 3 Kc test tone and just prior to shut down what we believe are Russian Orbita ground station instructions from Molniya control advising the ground terminal operators that a switch is coming up.

MOLNIYA ORBIT TIMES

Based upon observations at the first of August the Molniya birds continue to make a complete trip around the earth in approximately 23 hours 55 minutes and 40 seconds. This means they continue to 'slip' approximately 4 minutes and 20 seconds per day; apogee one day will be 4 minutes and 20 seconds **later** than it was **the day before**. Late July measurements also indicate that Molniya orbits have begun to drift **to the west** (i.e. apogee is occurring as much as 3 degrees further west in late July than it was in mid-June). Detailed instructions for tracking and plotting Molniya are found on pages 42 to 49 in **Coop's Satellite Operations Manual** and on the '**They Call This Bird Molniya**' videotape from STT.

To update the tracking times to the month of September, here are the projected turn-on, turn off and apogee cross over (i.e. shift from south / north to west / east trajectory) times. The numbers given here are in GMT (Greenwich Mean Time) which is eastern daylight plus four hours (etc.) and the times given are the projections for September 15, 1980. To calculate days either side of September 15th add 4 minutes and 20 seconds per day for each day prior to the 15th you are looking, subtract 4 minutes and 20 seconds for each day after September 15th you are looking. **CSD** is looking for **your own** observations as feedback with special interest in exact turn-on, turn-off times with the date of observation.

Projected 9-15-80 Operating Parameters [GMT]

	#1	#2	#3	#4
Turn On	0701	1219	1837	0025
Turn Off	1219	1838	0025	0701
Apogee	0847	1325	2034	0230

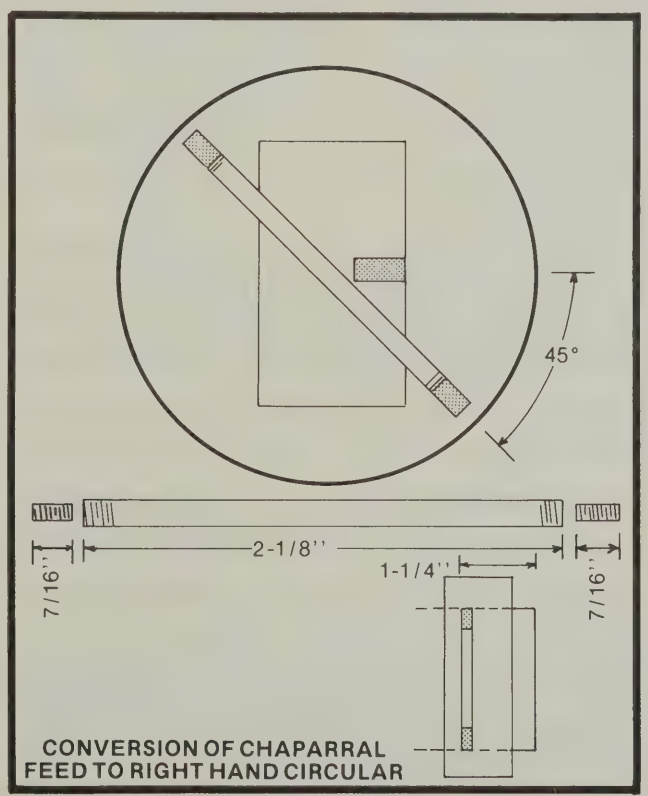
ADDING RHC TO CHAPARRAL FEEDS

If your TVRO installation(s) is equipped with a **Chaparral** scalar loaded feed horn system and you would like to **add 2 to 3 dB** to your recieved signal power when tuning in right hand circular polarized signals (Molniya, Ghorizont, INTELSAT) here is a clever trick worked out by Taylor Howard which may well be the least inexpensive 2 + dB you can add to your system.

We calculate the cost to be less than 50 cents; possibly totally free if you have a used BIC pen laying around on your desk and can scare up some 3/16'' diameter aluminum or brass rod (such as welding rod). No, **steel will not do**!

The instructions are almost too simple. Your present LNA has a linear feed probe, or, your present (tubular) feed has a linear probe pin. You rotate that probe pin to a vertical position when you want vertical polarized reception and to a horizontal position when you want horizontal reception. Right hand circular polarization, as employed almost universally outside of North America, can be received on a linear probe but in doing so your probe only intercepts a portion (roughly 50%) of the right hand (circular) polarized signal wave front. The Birkill feed widely described in **CSD** and other STT literature allows you to select by alignment of a set of pins inserted into the feed system in front of the actual pickup probe either right hand circular, or left hand circular, vertical or horizontal polarized signals. These pins inserted into the waveguide chamber between the front or lip of the feed and the actual feed probe disrupt the flow of RF energy along the inside of the waveguide leading to the probe. By carefully adjusting how **long** the pins are and **where** they are inserted in the waveguide you can disrupt the right hand circular wave front so that it, for example, becomes a linear polarized signal.

After getting all wrapped up in Molniya reception Tay Howard decided to see if he could get that last 2 to 3 dB from



CONVERSION OF CHAPARRAL FEED TO RIGHT HAND CIRCULAR

TVRO SYSTEMS

SYSTEM I - Prodelin 15' Antenna — Microwave Assoc. VR-4X Receiver, Two Avantek 4215 LNA's, Video Tape Recorder/Modulator, Cables.
Dealer Cost $13,950.00

SYSTEM II - Prodelin 12' Antenna — remaining equipment same as System I.
Dealer Cost $12,700.00

SYSTEM III - Prodelin 10' Antenna — remaining equipment same as System I.
Dealer Cost $9,990.00

SYSTEM IV - Microwave Assoc. VR-3XT Receiver, Prodelin 10' Antenna, one Avantek 4215 LNA, Modulator, Cables.
Dealer Cost $6,995.00

SYSTEM V - SAT-TEC R-1 Receiver, Prodelin 10' Antenna, one Avantek 4215 LNA, Modulator, Cables.
Dealer Cost $4,995.00

Prices net and do not include freight or tax if applicable.
— write or call for catalog —

DELSTAR SYSTEMS

Distributors of Earth Satellite Systems/Equipment
7800 Bissonnet, Suite 200 Houston Tx. 77074
713/776-0542

Alaska Microwave Labs

4335 E. 5TH STREET ANCHORAGE, ALASKA 99504
(907) 338-0340

TRANSISTORS

MRF901 FT4 5GHZ	$ 3.00
BFR90 FT5 0GHZ	$ 3.00
NEC 02137 FT4 5GHZ	$ 3.25

HOT CARRIER DIODES

MBD101 UHF—MICROWAVE	$ 1.50
ND4131 4GHZ NF—5.75 DB	$ 19.00
4GHZ NF— 6.5 DB	$ 2.00

CHIP CAPACITORS

1.2 2.2 3.3 4.7 6.8 10 18 22 27 47 100 120 180 220 270 330 390
470 560 680 820 1000 1200 1800 3900 8200 $ .60

RF - IF I.C.

MWA—110	.1 TO 400 MC 14 DB GAIN TYP
RF—IF AMPLIFIER I.C.	3 TERMINAL IN, OUT, & GROUND $ 7.95

GaAs FETS

MGF 1400 NF 2.0DB AT 4GHZ MAG 15DB	$ 28.50
MGF 1412 NF .8DB AT 4GHZ MAG 18DB	$ 75.00

DUAL GATE MOSFET

RCA 40673 $ 1.50

COAX CONNECTORS

SMA CHASSIS MOUNT SQUARE FLANGE	$ 5.90	TYPE N CHASSIS MOUNT SQUARE FLANGE	$ 3.20
SMA PLUG FOR RG—58	$ 5.57	TYPE N PLUG FOR RG—9/RG—8	$ 3.69
SMA PLUG FOR RG—174	$ 5.57		

FEED-THRU CAPACITORS

500 Pf $ .50

TEFLON CIRCUIT BOARD

APPROX. 3.5" x 5.0" x .010	$ 5.50
APPROX. 3.5" x 5.0" x .0312	$ 6.50

CHIP RESISTORS

50 OHM WATT $ 1.50

PISTON TRIMMERS

Triko 201—01M .5—3Pf( )1—8Pf( ) $ 2.50

OPEN AT 8PM EST CLOSED 8PM PST
ORDERS ARE POSTAGE PAID
COD—VISA—MASTERCHARGE
IF YOU DO NOT SEE WHAT YOU WANT ASK

RHC FOR CHAPARRAL feed - starts from salvaged Bic Pen!

RHC POLARIZER installed in mouth of Chaparral feed

WEDGE threaded rods [two ends] into position 1.25" back from mouth of Chaparral feed as shown in diagram.

Molniya's RHC without a lot of fuss and bother. Being a microwave engineer didn't hurt since he was able to boil the actual problem down to the very basics. And having designed the Chaparral feed, he knew what had to be done to make it 'convert'.

The photos and the drawings tell the story. Tay took a 29 cent BIC pen barrel and cut it off so that it was 2-1/8" long. He cleaned out the ink, naturally. Then he tapped the barrel at both ends with a 12 x 24 thread which would allow him to screw into the barrel a piece of metal rod which had been similarly threaded with 12 x 24 threads. You may use brass or aluminum for the rod but not steel. Tay used some 3/16" diameter aluminum welding rod and it is cut to 7/16" length.

One of the threaded rods is screwed into the barrel so that approximately 1/8" sticks out of the barrel. If you tap into the barrel at one end only 5/16" the rod will thread in just to the end of the tap-threads and stop. The opposite end accepts the other rod. Now take the plastic barreled rod carrier and slide it into the mouth of the Chaparral feed as shown here; it must be inserted so that it is lodged between the inner walls of the

Chaparral feed pipe 1-1/4'' back (inside) from the mouth or opening **at an angle that is 45 degrees** with respect to the feed probe in the horizontal position.

The signal ignores the plastic BIC pen holder 'carrier' for the threaded rods; the holder is turned until the two metal rods are wedged tightly, straight across the waveguide tube, at the 1-1/4'' in location specified.

That's all there is to it! With the feed and LNA now back in service you will have between 2 and 3 dB **more signal** with a RHC signal than you would without the device. Tay and we found that if you insert the carrier plus rods at an angle 180 degrees advanced from that shown (which would be the alignment for left-hand circular polarization) the Molniya or Ghorizont signal disappears completely. The axial ratio for the purists is nearly 3 dB and the polarization mis-match should be a small fraction of a dB. YES - you could improve the performance a fraction of a dB with multiple pins but as Tay notes ''...it would be like gilding the proverbial lily...''.

And best of all, when you tire of playing with Molniya or Ghorizont you can simply screw-out the 29 cent RHC adapter and return your system to its original unfettered linear polarization!

SOME NOTES ON USING THE SOLAR ALIGNMENT AHEAD

USING THE SUN

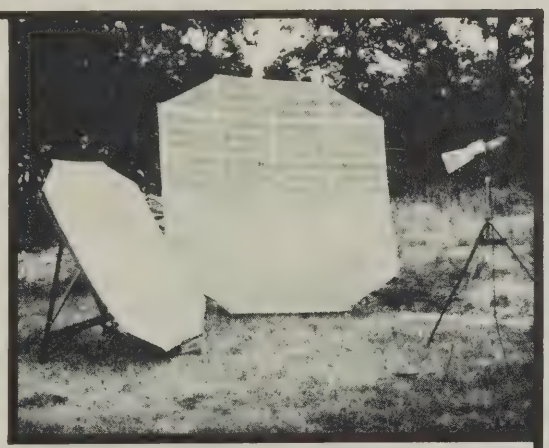
The sun, believe it or not, is a very useful tool in system check out. It is also, twice per year, a source of interference to the TVRO terminal.

Our sun is a radio noise source. If you have an antenna of sufficient gain and a receiver system of sufficient sensitivity, you can point the antenna at the sun and you will hear a 'roar' in the receiver audio and on the receiver video you will see a very dramatic increase in (white and black) noise impulses. The same general techniques are in use daily by radio astronomy observatories all over the world, tracking (normally) not our sun but rather tracking more distant stars.

Your ten foot (or larger) antenna and your 120-300 degree K LNA and your TVRO receiver is a more than adequate system to 'receive' the sun's noise. Now, why and how would someone actually set out to point their antenna at the sun?

First of all you should **never** point any antenna at the sun **unless** it has been painted some light color (flat-white is traditional but other light, pastel colors will do just fine). There was, early in the satellite business, much concern in the CATV terminal field about what paint to use. It was actually thought that a very special light-scattering-pigment dull white paint was required even though it sold for $265 a gallon more than four years ago! (It takes about one gallon to paint the reflector surface on a 20 foot antenna and many need to be painted every year; at least every second year.) Then it became apparent that the rationale for the expensive paint was being over-sold; true, you do need a white paint (white reflects most of the sun light)

THE UNBEATABLE PAIR!

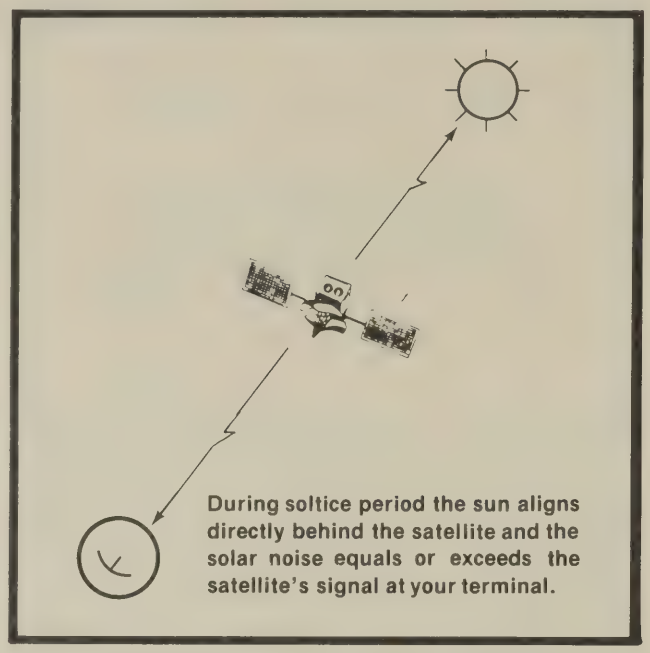


BY NOW virtually everyone knows you have at least two good choices when selecting your satellite TV antenna. The parabolic dish, and, the Spherical. And most people now know that the Spherical offers advantages no parabolic can offer. Such as multiple-satellite visibility, far lower wind resistance (the winds blow through the surface), and not insignificantly lower cost.

THE 8-BALL is the leading antenna line in the Spherical field. Hundreds of 8-Ball antennas are now providing high quality reception from Canada's frozen north deep into Mexico and the Caribbean. Our popular 12 foot size is now joined by a new 8 foot 'demonstrator special' which extensive testing reveals will perform as well as or better than any 10 foot parabolic on the market today! PLUS - with an 8 foot trailer mounted you can demonstrate the length of the full satellite belt (over any 30 degree span) right at your customer's location by simply moving the feed antenna from bird to bird; leaving the Spherical reflector surface 'in place'. BOTH the 8 foot 8-Ball and the 12 foot 8-Ball are now available in the standard mesh and a new 'tough mesh' for extra rugged applications. Pricing remains $750 for the standard 12', $780 for the ruggedized version whiie the new 8 foot is priced at $650 for the standard mesh and $685 for the ruggedized version.

SHOPPING FOR THE BEST LNA BUYS? Check with 8-Ball **before** you order because we'll give you a price on brand-new factory sealed Avantek 120 degree (50 dB gain) LNAs with the DC power block that will knock your eyes out!

VIDIARK ELECTRONICS DEVELOPMENT CO. Phone 501-895-3167 P. O. Box 57, Salem, Ark. 72576

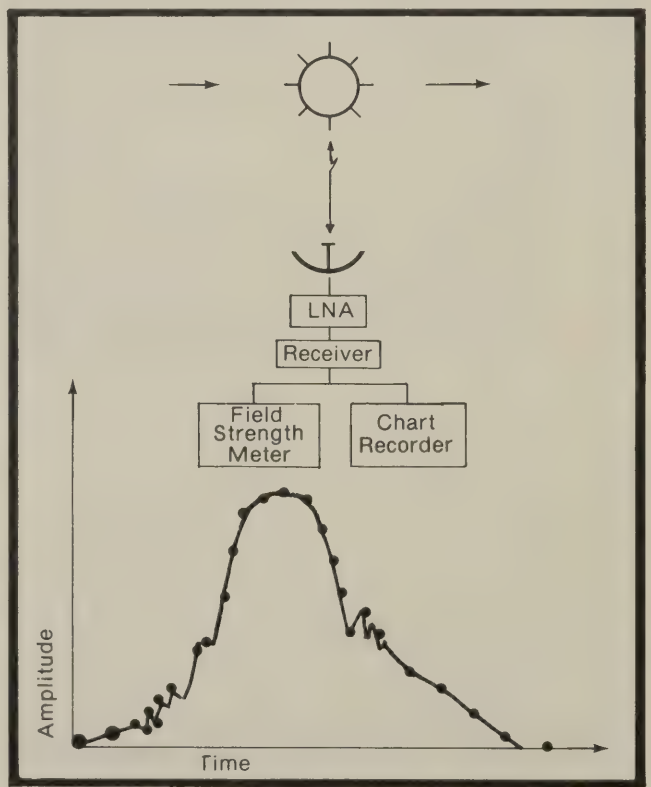


During soltice period the sun aligns directly behind the satellite and the solar noise equals or exceeds the satellite's signal at your terminal.

but it needn't cost $265 per gallon! In fact any reasonably good grade of exterior latex, put on with a roller (you can cover a ten foot dish in around ten minutes, a twenty foot in just over a half hour) is just fine.

Suppose you have a metal dish surface and don't paint it? Well, metal is 'bright' and it is a high grade reflector for sunlight. One test of a 20 foot antenna showed that at the focal point of the dish the temperature can exceed 2000 degrees F when the dish is pointed at the sun!

The sun, like the satlelite, will 'focus' when the parabolic antenna is pointed directly at it. You can in fact utilize the sun and a thermometer to find the exact focus point of a dish (if the dish is unpainted) but this is a dangerous exercise since the concentration of rays can get very-very warm (witness the 2000 F temperature). And twice per year, like it or not, the sun will either precisely align with your dish or come close enough to do major damage to anything mounted at the focal point (anything being the LNA, feedhorn, cables et al). When might that be? During the spring and fall, or the equinox period to be exact. As the sun heads north in the spring or south in the fall, give or take 20 days or so either side of the 'soltice' the sun's movement through the sky will take it on a path where it moves along or across the geostationary orbit belt from your location. When this happens the sun will for a period of a few minutes to perhaps 15 minutes maximum directly line up **behind** the satellite. We refer to this period as the twice-annual 'sun' (or solar) outage. In the satellite business this outage is something we just learn to live with. As an alignment from your location to the satellite and then the sun occurs, a slow but dramatic increase in system noise level occurs. The normally clear picture starts to get sparklies in it, the sparklies get very strong, and then for perhaps a minute or two the sparklies are so strong that very little or no picture shows; then it starts to clear up and in a few minutes it is back to normal.



Why does this happen? Again, because the sun is a potent radio signal source, even at 4 GHz and when the sun's path aligns it behind the satellite the TVRO antenna **sees that noise** as just another transmitter source. It so happens, by some quirk of celestial mechanics, that with our present generation of 5 watt output power geostationary satellites that their power output at 24,000 to 27,000 miles has almost exactly the same signal level 'on the ground' as the sun 93,000,000 or so miles distant. One (the sun) cancels the other (the satellite) when there is complete alignment.

You can tell when this alignment is coming; mark your calendar between September 1 and October 15th or so; the further north you are from the equator the later in the year it will 'hit you'. Between 2:30 and 5 PM local time for SATCOM FI you will notice two to four days of 'solar interference'. If you have a prime focus feed the shadow cast by the feed on the antenna's surface by the sun will fali directly into the center of the dish when there is alignment. Keep an eye on the prime focus shadow in this period; noting that as September moves along the shadow which is below the center of the dish moves slowly, each day, up the dish a little. On the day **prior to** the best alignment the sun's shadow will be very close to the **center** of the dish and on the day **after** it will be slightly above the center. In the spring (between March 1 and mid-April) the process repeats except the shadow location reverses since the sun is now coming back north rather than traveling south.

NOW - how can you use the sun to test your dish and receiving system? Very simply. On a bright day notice where the shadow is on the dish surface between noon and say 3 PM (if the satellites are in a southwesterly direction from you). Decide how much up or down you would have to move your elevation to get the shadow of the sun during this period of the day squarely into the center of the dish. Then set out to deliberately tilt the antenna elevation so that the sun, as it moves thorugh the sky, will align with your feed throwing the shadow of the prime focus feed squarely onto the center of the dish.

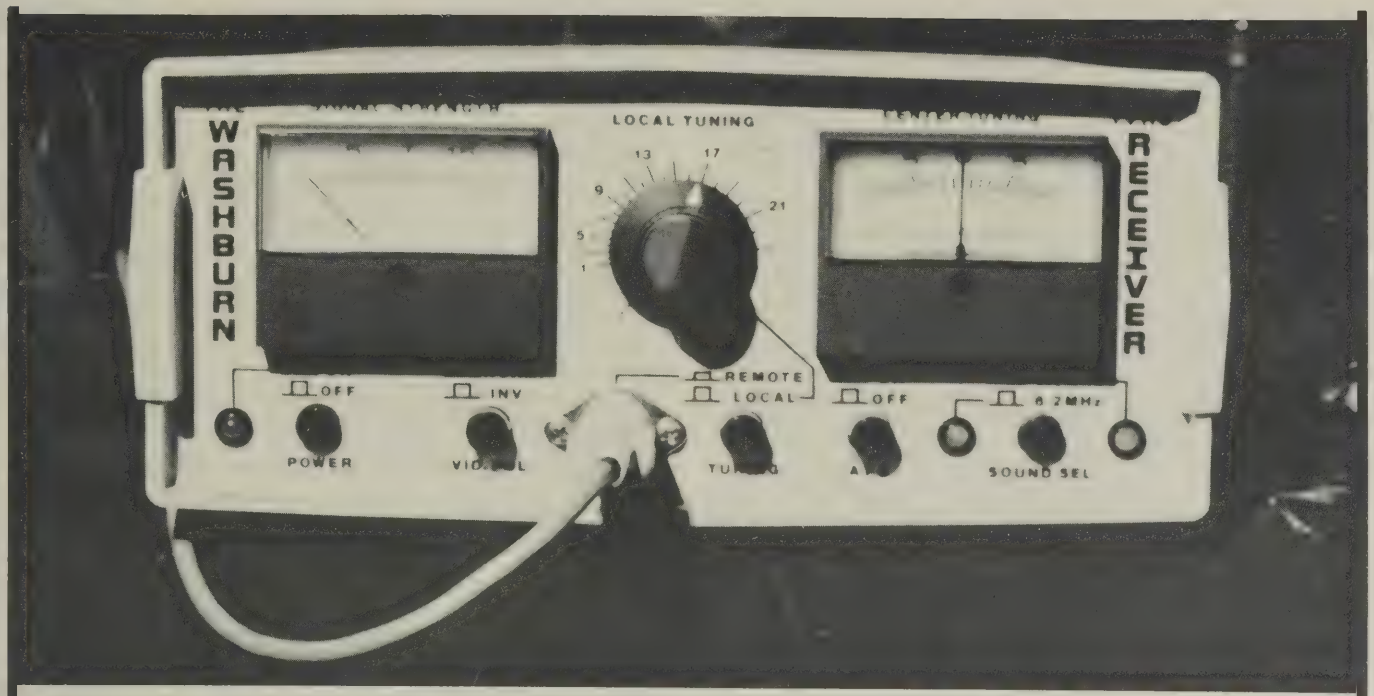
If you start out with your dish 30 minutes (real time - not longitude!) or so **west of the sun** and have the elevation properly adjusted the sun will move westerly and pass directly through the 'boresight' of your dish. How can you use this exercise to your advantage?

1]Have the LNA and receiver running.

2]Have a (CATV/MATV) field strength meter connected to the receiver IF, or an oscilliscope set to read system noise floor plugged into the video output of the receiver.

3]Optionally, if you can locate a chart recorder that will read a 20 dB range (window), have it connected to either the video output of the receiver or the chart recorder output (demodulated output) on the field strength meter.

Now, as the sun moves into the antenna's pattern the broad range, even-strength (i.e. stable output) solar noise machine will produce an increase in the noise level on your receiver. You can read (and write down) this change in 30 second increments on the field strength meter, or you can record it with the recording pen attached to the chart recorder.



THE WASHBURN™ TVRO RECEIVER

EXCEPTIONAL PERFORMANCE

- **TRUE EXTENDED THRESHOLD** - 7 dB under full video modulation conditions, achieved through meticulous attention to removing limitations imposed by components.
- **HIGH FIDELITY VIDEO** - Full 30 MHz I.F. bandwidth and 8.4 MHz video bandwidth prior to final subcarrier filtering, coupled with heavy negative feedback in all high level video stages for very low differential distortion and controlled transient response.
- **HIGH PERFORMANCE AFC** - Eliminates the need for fine tuning and provides additional dispersion rejection for full use of the I.F. filter bandwidth and superb interlace.
- **FULL REMOTE CONTROL** - 25 ft. (extendable) remote allows an untrained user to easily select transponders and control the volume of the High Fidelity Audio Output. Normal transponder selection automatically commands correct feed polarization through a closed-loop servo.
- **SELECTABLE SUBCARRIER PRIORITY** - With visible subcarrier indicators and two easily changed plug-in detectors (5.5 to 8.4 MHz available, U.S. or CCIR format). Usually eliminates the need to manually select subcarriers, while allowing manual control when desired.
- **FULL FUNCTION METERING** - With selectable manual tuning and AFC disable allows checks of system CNR without additional equipment. Continuous monitoring of Signal Strength (in linear dB) and AFC Correction (in MHz).
- **VCR COMPATIBLE** - Video and audio levels allow use of your VCR as a modulator, providing immediate recording without cable changes when desired.
- **DESIGNED FOR RELIABILITY** - Careful cost/performance balance to insure continued quality reception.

SUPERIOR VALUE

- **LOWEST IN-PLACE SYSTEM COST** - "Bargain" receivers stop being a bargain when you add up the antenna and LNA costs for sparklie-free reception with higher thresholds.
- **USER ACCEPTANCE** - Compact, pleasant packaging, easy operation, and high performance with small antennas suit it to homes and neighborhoods where "experimenter's" equipment would be unacceptable.
- **VERSATILE** - Easily reconfigured for shared use of a single ortho antenna by multiple receivers and homes.
- **SIMPLIFIED INSTALLATION** - Separate Demodulator Console, Downconverter, and Rotor Control Assemblies eliminate routing (costly) hardline through finished rooms and allow easy relocation of the control point.

NOW PRODUCED EXPRESSLY for designer Clyde Washburn with his supervision of strict Quality and Performance Standards. Receivers, kits, components and factory alignment available!

Direct all inquires to: **CLYDE WASHBURN, JR / P. O. Box 636**
FAIRPORT, N.Y. 14450 / 716-223-7457

If you write down field strength readings, after the event is all over you can take the readings and place them onto a piece of linear graph paper. Plot each 30 second increment reading and then connect each plotted point together. You will produce a bell shaped curve that will be your TVRO antenna pattern (time or degrees of antenna beamwidth will be along the bottom line; antenna gain or front end selectivity will be reflected by the vertical amplitude line).

In effect you are operating your antenna on a 'test range' and 'sweeping it' with a wideband noise source. Properly done, repeated several times and the results averaged, there is no more accurate way to determine [**1**] the actual pattern of your antenna, and, [**2**] with some calculation the gain (or relative gain) of your antenna. Now since the gain of your antenna largely depends upon the pattern of your antenna, and this in turn is a function of antenna size, antenna f/D and the pattern of your feed antenna, you now have a very handy way to experiment with these antenna parameters to determine which is truly best performing for you. For example, is one feed better than another? The antenna sweeping of the sun will tell you. How far 'down' is your antenna first side-lobe? Sweeping of the antenna will tell you. Even system sensitivity can be computed by this test approach.

This repeated warning however. When you play with the sun, make very sure your antenna is properly painted! You can check this by placing a thermometer at the focal or feedpoint when you first run the tests. The temperature at the focal point should increase only slightly (by less than 25 degrees F) over the ambient (air temperature when you sweep through the sun. **You don't want to cook your electronics while testing!**

ANTENNA SIZE vs. SOLAR NOISE[*]

The amount of solar noise to be nominally expected with your terminal will depend upon the system antenna size, gain, and system electronic sensitivity. The following guidelines will give you a reference point to begin with; degradations below these levels will tell you there is work to be done, above these levels will tell you that your system is functioning better than the 'normal' system of this size. These numbers assume a 30 MHz IF bandwidth and 120 degree Kelvin LNA. Note that for these tests your receiver AGC must be dis-abled if you are likely to be 'into limiting' with the receiver before the maximum levels shown here are reached; otherwise the levels will 'top-off' prior to the actual peak indicated level.

Antenna Size	Nomianl Gain	HPBW[**]	Antenna Noise [K]	dB Noise
6'	35.0 dB	3.02°	460°K	4.1 dB
8'	37.5 dB	2.28°	800°K	6.6 dB
10'	39.5 dB	1.82°	1300°K	8.5 dB
12'	41.0 dB	1.47°	1850°K	10.0 dB
15'	42.9 dB	1.18°	2800°K	11.9 dB
20'	44.5 dB	1.00°	4100°K	13.5 dB

*This assumes a 'quiet sun' (i.e. one not aggravated by a solar storm created by extraordinary sunspot activity).

** - Half-power beamwidth for the antenna, indicating the total 3 dB portion of the antenna pattern curve at the nose of the pattern. For example, a 3.02° HPBW indicates that 1.51° either side of the center of the antenna pattern the signal level (solar noise) should be -3.0 dB reference the center. Note that for the antenna sizes greater than 20 feet the HPBW of the antenna (which will be smaller than 1°) creates a new measurement adjustment since the sun's surface subtends a 0.5° arc in space and larger antennas are actually capable of focusing on only a **portion** of the sun's surface resulting in reduced readings.

LOOK FOR vastly improved situation for Washburn Receiver kits and wired and tested units very soon. Clyde Washburn has completed contractural agreements with major developer / supplier of microwave hardware and is now fulltime himself on project. Washburn and former supplier terminated their agreement on July 1st and fate of the novel receiver was up in air until just recently. Washburn plans 50 kits per month initial capacity to be followed as soon as October with about the same number of wired and tested units per month. Pricing for kits and wired and tested units will drop by about 30% from previously published prices. You can get ahold of Washburn direct and get assistance at 716-223-7457 from 9 to 5 weekdays or write firm at P. O. Box 636, Fairport, New York 14450.

AVCOM- SETTING THE PACE OTHERS FOLLOW IN TECHNOLOGY!

NOW in full production, AVCOM's COM-3 and COM-3R 24 channel satellite video receivers! The 'hit' of San Jose because they combine excellent styling with the superb extended threshold performance that made our innovative PSR-3 receiver series the standard of comparison for the entire industry.

COM-3 features 24 channel switch-tuning; **COM-3R** gives the user remote control of the switch-tuning. BOTH have the best low-signal-level extended threshold performance in the industry today with a unique discriminator circuit that makes PLL equipped receivers 'pale' by comparison.

AVCOM of Virginia, Inc. • **[804]320-4439**
10139 Apache Rd., Richmond, VA 23235

TECHNICAL NEWS NOTES

WATKINS-JOHNSON so impressed with growth and direction of low-cost terminal industry in San Jose (they were there as guests of John Ramsey) they are talking of off-the-shelf delivery (!) on wide range of VTOs by 1 November. Included are V815 (2.7-3.7), V707 (.875-.915), V802 (2.4-3.7), V901 (3.6-5.0) and V907 (3.6-4.2). Val Jackson at 408-438-2100 can fill you in.

$995 MAY NOT be 'low priced receiver' by SBOC. David Barker's image-cancelling single conversion approach (see **CSD** for June) headed for marketplace as 'ultra-low-cost' receiver likely to be in $700 price range when announced.

ANCHORAGE (AK.) cable system will be first to use COMSAT licensed 'Torus' spherical antenna. This version will look at 20 degree window from 136 to 116 degrees taking in 5 satellites but only 2 of which will have regular program video of interest to cable systems. Size will be 10 meters.

JUMP in home VCR (½'') market worldwide likely to lead to parts shortages in allied areas. Likely tight areas will be small signal transistors and ultra-compact capacitors. Japan predicts monthly VCR output of 540,000 by December.

MAJOR CHANGES in Britain policies towards private investment and operation of space facilities may herald total turn about of small industry there. Latest proposals would greatly reduce influence on communications by Post Office Telecommunications Office. Country now proposing SBS (business system satellite) program to be operated and owned largely by private investors. Earlier proposal for direct broadcast television service still alive.

FACSIMILE newspaper service has been tested in Japan

utilizing UHF band satellite launched two years ago. Extremely narrow band system greatly reduces size of receive terminal antenna package allowing under $250 individual home terminals to access bird signal. Not applicable to wide band (video) at moment.

LATEST Spanish International Network Satellator (translator fed directly by satellite) now operating in Albuquerque.

SHUTTLE propulsion unit suffered another abortion when scheduled test of system was shut down less than 20% of way through test sequence.

LOOK FOR renewed battle of parabolic feed system designers to start any day; success of Tay Howard designed Chaparral 'super feed' has spurred rapid development of additional scalar feed designs and new battle of specs is bound to ensue.

ONE OF the more interesting 'new' antenna designs scheduled for debut at SBOC Houston is 10 footer that inter-locks together like Prodelin design seen in San Jose. Designer utilizing foam-filled construction technique for parabolic surface, antenna mount system and feed with result being ten foot antenna weighing around 150 pounds complete (with mount) that knocks down for shipment to UPS dimensions and pricing in $1500 quantity one region.

ANOTHER possible source for SECAM Monitors; NBC had massive order with Tektronix of several hundred units scheduled for shipment to Moscow. At least 100 were shipped prior to pull out of Olympic coverage and may not have reached destination in which case they will be returned. Modules to build equal number reportedly in stock at Tektronix factory.

FIRST 20 foot Paraframe antennas scheduled for delivery this month; units will go to South Florida.

CSD SUBSCRIBER NOTICE: If you are moving or for some other reason wish your **CSD** shipped to alternate location **we must have** the computer address label from your mailing envelope (showing old address and certain key numbers) **plus** know month in which your subscription began. Since **CSD** is mailed first class mail it will be forwarded to your new address in interim. Save an envelope label in a safe place 'just in case'.

GOOD NEWS FOR TVRO DEALERS/ DISTRIBUTORS/ MANUFACTURERS!

Bob Cooper has prepared a custom sales demonstration videotape for you! Running approximately 11 minutes, '**The Satellite TV Story**' captures the excitement and spirit of having satellite TV in your home. Perfect for one-on-one pre-selling, groups, un-attended displays. Color of course, prepared by Coop so that viewers grasp the essentials of a home terminal and how it works. AND - on the same (VHS or BETA) tape is approximately 50 minutes of 'informal Coop' directed to installers and dealers filled with system installation pitfalls and solutions. Excellent for training your people!

This custom videotape is available on BETA or VHS. The price is $60 per copy **but** for an extra $10 we'll 'tag' it with your company name, address and telephone number. Shipment within seven days of receipt of order. If you order the 'tagged' version be sure to specify what the tag is to say, and tell us whether VHS or BETA. **Order STP-1.**

PLUS - The world-famous 'Satellite TV Handbook' (more than 15,000 in print now) which has introduced tens of thousands to home satellite TV (at $7.50 each) is now available **in 50-Handbook-Bundles** for $125 (postage paid within US, Canada). The perfect introductory piece to satellite TV and each copy carries the full $7.50 list price. Sorry - only available in bundles of 50. **Order SEP-1 at $125.**

SAVE EXTRA MONEY by ordering 'Combo-Package' including a 50 bundle of Handbooks **plus** STP-1 videotape. Price is $175 US and Canada or $185 with custom tag on videotape. US funds only. **Order CP-1.**

STT P. O. Box G, Arcadia, OK 73007 405/396-2574

SBOC'80
HOUSTON

SATELLITE BUSINESS OPPORTUNITIES CONFERENCE

A very special kind of **Satellite Seminar for professionals** looking for the right answers to getting into the satellite TV business; profitably. So special that we call it a business opportunity conference. Which is exactly what it is...a gathering of people and firms who are looking for the best combination of marketing strategies, hardware packages and services to offer to the television viewing public. Only SBOC Houston doesn't stop there. Intensive three day session includes a hard look at **every aspect** of capitalizing on the tremendous potential in low-cost satellite systems. From uplink ownership and operation to programming packages via leased satellite transponders. Dozens of exhibits, dozens of hard hitting seminar sessions, more than 30 hours of special in-house television programming from past SPTS events. **PLUS** - the very latest in new technology from new super light weight antenna systems to complete terminals that have all of the electronics integrated into the dish antenna. If you believe there is money to be made in the low-cost satellite communications field, you need to be at SBOC '80 Houston!

SBOC '80 / HOUSTON - November 17-18-19, 1980

SBOC '80 / HOUSTON - The Adam's Mark Houston Hotel

SBOC '80 / HOUSTON - Registration fee (includes special new business opportunity manual) is $150 per person

SBOC '80 / HOUSTON - From the same folks who bring you SPTS, CSD and a world of practical satellite information. Use registration card to right.

SATELLITE BUSINESS OPPORTUNITIES CONFERENCE
SBOC '80/HOUSTON

COOP'S COMMENT ON PROGRAMMING

MY PROBLEMS WITH HR 7747

This month's programming section includes the text of House Bill HR 7747, the so-called anti-piracy bill now heading through Congress and attracting the support of MDS, STV and many of the satellite TV transmission service programmers. As detailed last month and to additional extent in this issue of **CSD**, the bill is dangerous to the extreme of being terrible overkill. How anyone can rationalize a $250,000 'fine' for interception of a MDS, STV or indeed satellite TV transmission is almost beyond comprehension. We are all painfully aware of the ravages of inflation but this is absurd!

My primary complaint is not the irrational nature of the bill which throws everyone receiving MDS, STV and satellite transmissions into the same black pot but rather with the brakes this bill is likely to place on the development of American low-cost space technology know how. We constantly hear complaints in this country that as a nation we have abdicated our industrial technology lead to Japan and Europe. That we have become a nation of importers rather than our long held posture of being exporters. I am now beginning to suspect that we have lost our techology lead because we legislated American know how right off shore!

No nation in this world has done a thing with low-cost 4 GHz technology except America (and a handful of Canadians). The thousands of people who have accepted the 4 GHz challenge in their workshops and small business firm labs have shown that American ingenuity, if allowed to mature on its own, is still very much capable of grabbing the lead world wide. A relatively small cadre of non-affiliated techonologists including Howard, Coleman, Ramsey, Washburn, McCullough and perhaps a dozen or two more have shown us just how well the American system can work given a chance. HR 7747 wants to kill all of that and in doing so I can see 4 GHz technology heading for Asia in one big hurry.

HR 7747 wants to penalize anyone who tunes in a satellite transmission which he does not have authority to tune in. The United States Department of Justice, in a formal filing with the Federal Communications Commission on March 26, 1979 addressed itself to this very question while commenting on FCC Docket 78-374 (wherein the FCC did away with licensing of receive terminals). In that 1979 filing the DOJ said "(one) **rationale devised in support of the Commission's present receiver licensing programs is that these receive-only terminals can potentially be used for unauthorized reception and possible divulgence of information relayed via domestic satellite systems. Under Section 605 of the 1934 Communications Act, it is illegal to intercept and divulge the content of non-broadcast radio signals.**"

I question why the FCC or any other federal enforcement agency should be in the business of 'protecting' private transmissions. The DOJ in their 1979 filed notes "**The FCC is not a guarantor under the 1934 Communications Act of private commercial operations...presumably commercial firms are as capable of protecting their own commercial interests as are federal regulators...indeed, should the problem of satellite transmission 'pirating' materialize, there are essentially no real economic or technical reasons why those transmissions could not be 'scrambed' and the problem eliminated promptly as a consequence**".

I intensely dis-like 'personal interest' legislation; that is law created to help one group to the detriment of another. I especially dis-like such legislation when it is enacted because the groups being helped are simply too lazy or cheap to do what the DOJ suggests they should be doing if they are concerned with piracy; i.e. scrambling. To paraphrase the DOJ comments one paragraph back... 'The US Government is not a guarantor of private commercial operations'. We need **less** government, not more government intrusion in our private lives. Good grief.

Worse yet there is already in place plenty of legislation to give MDS, STV and satellite programmers concerned about piracy tools to enforce their complaints. The DOJ 1979 FCC filing notes "...**Section 605 can be the basis for Federal criminal prosecutions...**(additionally) **the 1968 Omnibus Crime Control Act makes the mere interception of protected communications a Federal crime** (and moreover this statute) **affords injured parties special civil right of action** (including) **liquidated or actual damages plus attorneys' fees**...(finally) **the unlawful interception of copyrighted programming using receive-only antennas may under the 1976 Copyright Act render persons subject to civil infringement actions, suits for injunctions, the impoundment and recovery of profits and other remedies**".

We don't need new, additional, expensive special interest legislation. As our Department of Justice notes there is ample legal remedy for prosecution of unauthorized interception of private communications. **HR 7747 is an example of private business attempting to mis-use the federal government's legislative powers.** The consequences of this legislation will be the potential loss of America's technology lead in low-cost satellite communications systems. Worse yet, such a law will scare away many legitimate public uses of low-cost satellite communications technology because only the bottom line will be remembered; a fine of $250,000 per individual infraction.

Together we can do something about this. S.P.A.C.E. is our best hope.

COOP'S SATELLITE DIGEST (Programming Section) is published monthly by Robert B. and Susan T. Cooper doing business as Satellite Television Technology (STT). Editorial offices located at West Indies Video, Grace Bay, Providenciales, Turks & Caicos, BWI. Communication with editorial office is through Business Office at P. O. Box G, Arcadia, OK 73007 (405-396-2574); Rick Schneringer, Manager. Photography, Kevin Paul Cooper; editorial assistance Tasha Anne Cooper. STT produces various manuals, videotapes, guides and texts plus conducts the twice annual SPTS and once-annual SBOC events. STT is not affiliated with any manufacturer or distributor of satellite communications equipment. **CSD** subscription $50 per year US/Canada/Mexico; $75 elsewhere. Total contents copyright 1980 STT, USA & Turks and Caicos.

GETTING CSD READERS OFF THE 'PERMISSION' HOOK

CLEARING MY CONSCIENCE

You don't have to read between the lines (as Steve Reed would say) to know from my 'Comments' section that I believe Representative Preyer is way off base with his proposed HR 7747. When I see folks like John Ramsey staying up for nights on end to design better low cost receivers or David Brough flying all over North America to help people put in low-cost spherical antennas or Tay Howard giving serious thought to leaving Stanford for a life of dedication to low cost satellite technology, I know we are all in this together and that we have to stick together; **or get it stuck to us!**

I have read and re-read the words of HR 7747 and I have read and re-read a ten page letter to Representatiave Preyer created by SPACE General Counsel Rick Brown and I have come to several conclusions about where we stand. The first is a negative. This is already an emotional issue and it is going to get much worse before it is through and done. Big business bucks are entering STV (over the air subscription TV) and MDS (multi-point distribution). **Big bucks are already** in the premium programming end of cable. These people are playing for keeps and they don't want to see the spread of what we all espouse. Well, we may be the little people but we don't have to roll over and play dead.

I think there is a fair chance this bill will get swift action and even approval. It **may** happen so fast that it sets a record or two. The only reason it might **not** is SPACE, and, this being a national election year (such years have a way of breaking up the Washington gathering much earlier than normal).

So in thinking about how to be sure that all of you people who are now into this 'satellite silliness' as Steve Gibson calls it do not get hung out to dry by this legislation, I decided something had to be done to protect you from yourselves. At San Jose I talked with dozens of people whom I asked "**Say - have you ever** bothered **to contact any of the** free **services on the bird for their written permission for you to access their transmissions???**". One said he had, several said they had meant to, most said 'no' they had not.

As I read HR 7747 you can get hung if you get caught watching something you don't have specific permission to view. Carrying that one step further if some federal person were to knock on your door and ask for entry, you would have at least an opportunity to make sure your kids were not switching to a transponder you were not supposed to be watching. Fred Hopengartern maintains that they will need either your permission to get into your house to inspect what you are watching or a court order granting them access.

But suppose you have a 12 foot dish out there in the yard and their first question is "**Do you have permission to view satellite services?**". I think you had better have at least one piece of paper, stuck away in a safe place, which you can trot out to show if called upon. That piece of paper should clearly state that you do have such permission. Yet in San Jose I found virtually nobody who had bothered to take that simple step (my own files are filled with letters from virtually everyone; HBO being the exception of course).

OK - if this is the way you are going to handle your own 'security' I'll do it for you. With this report is a certificate. On this certificate is clear language that tells anyone who comes to your door that **you have** the **official permission** of **CBN** - the Christian Broadcasting Network - to tune in their programming on SATCOM FI transponder 8. Therea re two things you **must** do to make this certificate worth the paper it is printed on:

1]You should cut it out of CSD and carefully type or print in your full name and your city and state (this certificate is good in Canada, the Bahamas, Mexico and anywhere else that FI transponder 8 can be viewed);

2]You must then send off a letter or a postcard or a piece of birch bark with a stamp on it as follows:

a)**Address it to** - Mr. Scott Hessek, Manager CBN Satellite Services, The Christian Broadcasting Network Inc., Virginia Beach, VA 23463.

b)**In the letter** or on the back of the postcard or down the side of the birch bark, tell Scott your full **name** and mailing **address** and also include your **CSD** mailing label computer **number**.

That's all you have to do. At this point you are fully certified by CBN to access their FI transponder 8. You will also receive in the mail each month a copy of the CBN Programming Guide (yes, even down to Mexico!).

Now this is not a shakey subterfuge; this is no end run **trick** to get around any law or regulation. **It will hold up** and **it is valid and legal.** Under a letter to me dated July 23, 1980 Scott Hessek has given me (and **CSD**) the official permission of CBN to '**given permission to all of the people who operate private earth terminals**' to view CBN. Furthermore as Scott says '**there are no strings attached; it is our pleasure to do so for we make the programming available so people can watch it**'.

Leaving the certificate intact in **CSD** won't cover you. It has to get out of **CSD**, be completed with your full name and city and state (or province) you reside in, and you must send your **CSD** computer label **number** plus your name and address to Scott's attention to complete the validation process. Mine has already been mailed (that's one of the few bonuses I get as editor and publisher; first access!).

So where does that place you? Where, if and when any authorized agent of any authorized federal agency ever knocks on your door, you can simply show him the certificate and state with a clear conscience. "**I have the full, written registered permission of The Christian Broadcasting Network in Virginia Beach, Virginia to be viewing their programming on SATCOM FI transponder 8...and that is why I have that 12 foot terminal in my yard and this room full of receivers, LNAs and recorders**".

I want to make sure everyone understands this is not some cutesy-idea conceived in a moment of passion. Quite the contrary, I believe we have to be prepared to defend our rights to view direct satellite transmissions when and where we have the clear rights to view and I don't want to see any of the early pioneers (which includes you if you are reading this) caught up in some emotionalism that puts you out of business before this industry really gets off and running.

YES - similar program permission can easily be obtained from PTL, Trinity and the new National Christian Network. For very little money permission from C-SPAN, Nickelodeon and CNN will follow. Most of the others cost a few more dollars but many of these will also grant you permission.

My fear is that you are so busy messing around with better antennas, neater LNAs and simpler receivers that you are putting off doing something that you may later regret. OK - I have done most of the work for you. And now my conscience is clear; the rest is up to you!

CBN STATUS

CBN is...

1)24 hours per day on FI transponder 8
2)Offering alternative competitive programming
3)Clasified as a programming service rather than a television station or as a 'Common Carrier' and it is copyright and black-out free
4)The owner of all of its own programming and no programming use fees apply
5)Available to you via telephone at 804-424-7777.

OFFICIAL

PERMISSION TO VIEW SATELLITE TV FROM...

CBN Satellite Services

THIS CERTIFICATE, issued by Coop's Satellite Digest and by The Christian Broadcasting Network (Inc) grants to a pioneer in the home/private satellite television industry full permission to receive the satellite television programming service of The Christian Broadcasting Network as presently carried on RCA SATCOM FI transponder 8 or as subsequently carried on any US or Canadian domestic satellite or on any other satellite where The Christian Broadcasting Network has entered into a contract for the transmission of its programs. This certificate grants to the home/private satellite TV reception pioneer named hereon permission to view and to share with others without cost the full 24 hour per day programming services of 'CBN'.

THIS CERTIFICATE recognizes the contributions already made by pioneers in this field and further recognizes that such pioneering efforts have led to the development of efficient, cost-effective private satellite terminals for all of North America. CBN and Coop's Satellite Digest jointly urge the continued pursuit of such technology for the good of all mankind and the eventual recognition that through the development of such low-cost satellite technology mankind the world over will one day live in greater harmony and peace.

THIS CERTIFICATE is granted to _____

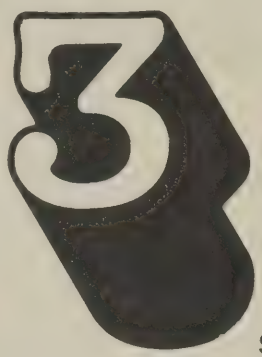
residing in _____, _____ and is issued without charge or qualifications on this 1st day of September in the year of our Lord 1980.

Bob Cooper Jr.

For **Satellite Television Technology**

Scott A. Hamm

For **The Christian Broadcasting Network**



NEW MANUALS FROM STT

(1)

Stephen Gibson's 'THE SATELLITE NAVIGATOR' is possibly the finest manual ever assembled by STT. Author Gibson covers every aspect of satellite 'navigating' (i.e. the art of finding satellites from your spot on the ground) and **he builds into this latest STT manual** cleverly designed navigational aids including an inclinometer (to measure your antenna's elevation) and a Sun Compass (to help you accurately measure azimuth). Gibson goes from the very elementary mount (a laundry pole in the yard) to super sophisticated mounting systems including a complete electronic interface box to tie your motor driven dish antenna to your TRS-80 (or similar micro) computer for full 'autodish' operation. Filled with practical tips on mount design and construction, step by step instructions on 'boresighting' the satellites, computer programs galore and the word of an experienced man on trouble shooting your system. Bob Cooper says "I read this manual six times during the course of preparing it for publication; each time I found myself discovering new ways to modify my own antenna mounts. This manual may well be a curse to my spare time; after reading it I have dozens of new projects to get started on!" The price is $30 postage paid US, Canada, Mexico; $35 elsewhere. A must for any serious satellite terminal operator.

(2)

Nelson Ethier's 'PARABOLIC TVRO ANTENNA MANUAL' will probably make several people independently wealthy. Here is the full 'game plan' for starting up a business building 10, 12 (or larger) foot TVRO antennas, mounts and feeds. Nelson's manual will make everyone an instant expert on the nitty-gritty world of building superb, high-quality parabolic reflector surfaces. He uses a combination of fiberglass and metal to produce a professional looking, high-performance dish that virtually **anyone can duplicate** from his step-by-step plans for between $300 and $500. PLUS - he suggests that after you build a mold for your first dish that you rent the mold around to others in your area so that you in effect become a supplier in the antenna field! Nelson is a bug for having precision workmanship and he gives you complete instructions on achieving a 1/8th inch surface tolerance over the 12 foot surface. Formulas and instructions included will assist anyone who wants to build larger-than-12 foot antennas to do so. What a neat way to turn your garage into a factory! The price is $30 postpaid in US, Canada and Mexico; $35 elsewhere. Don't start building your own antenna until you study this manual carefully!

(3)

Bob Cooper's 'SATELLITE OPERATIONS MANUAL' probably should be kept under lock and key in your TVRO viewing room. Coop has been assembling data from people who like to mess around tuning in 'the hidden stuff' on satellite transponders for years and now he gives away all of the trade secrets. Like finding network executive intercom audio channels, news-wire teletype channels, the Moscow-Washington 'Hot Line' RTTY and voice link back-up on Molniya and more mundane stuff like several dozen Holiday Inn 'Holidex' 800-number reservation lines on satellite. He tells you where to tune in four different Anchorage, Alaska AM radio stations sent out via satellite, Alaskan flight weather, and hundreds more. PLUS - this manual is more than a clandestine sourcebook for the secret services. It includes dozens of step-by-step instructions for LNA and feed system operation, sub-carrier units, and a whole chapter on the latest Russian Molniya reception techniques. It even has a section detailing re-broadcast of satellite received channels via low-cost VHF television translators (including a look at such an installation). A section on trouble shooting your system; more than 20 chapter-sections in all! If you are into satellite reception, you need this new Coop manual. If you are thinking about getting into satellites, one look at this book and you won't rest comfortably until you too have your terminal up and running! The price is $30 postpaid in US, Canada and Mexico; $35 elsewhere.

RUSSIAN OLYMPICS VIA MOLNIYA AND GHORIZONT

The news headline in the Miami Herald read '**Antenna Dishes Out Moscow Olympics**'. Another headline read '**Antenna Puts Him on Wave Length With Olympics**'. Front page coverage in the New York Post and numerous reports carried on NBC-TV, CBS-TV and overseas by various international television services and news wire services turned Miami's Bob Behar into an instant celebrity during the recently completed Moscow Olympics. **Behar did it again** (see **CSD** for August); he put his 16 foot dish to work collecting 'forbidden'' signals and then saw to it that his business (A-B Electronics, Hialeah) got massive publicity.

Not everyone who had the equipment, time and inclination for tuning in the Russian Olympics via a Russian satellite got the exposure that Behar got. Perhaps they can be just as glad they didn't for shortly after Behar's report appeared on national television he got an official telephone call from a gentleman who introduced himself. ''**I am XXXX and I am with the State Department in Washington...**''. What did this caller want? ''**I am instructing you to cease and desist tuning in those Russian satellites**''. Behar quickly called us and we sent him to Rick Brown, General Counsel for S.P.A.C.E. In a later interview on another national television program we heard Behar tell the reporter ''**No, I don't feel I am in any danger or jeopardy for tuning in the Russian satellites. The Russians are not a party to INTELSAT and to the best of my knowledge the US has no agreements with Russia which address the question of our citizens tuning in Russian satellites or Russians tuning in ours**''. We suggested to Behar that his only real jeopardy with tuning in Russian TV was from Russia itself; he should keep an eye peeled for armed cossacks!

OOPS - WHO HID THE CAMERA! [Everyone is entitled to get excited Bob. Is that Moscow, Idaho???]

Well, so tuning in Russian satellite TV stirred up quite a storm! Actually it only did **after** Behar made the national and international news services. The BBC called from London and one of the more amusing anecdotes involves a call Bob got from Rede/TV Globo's New york City office. Globo is Brasil's largest television network and their news chief in New York thought Behar's achievement would make a good news feature for the folks back home. ''**I am sending down a news crew tomorrow from New York**'' said the news person. ''**Ahh, OK**'' responded Behar ''**while they are here I will let them watch your evening news from Rio de Janiero**''. A long silence followed. Finally the news type spoke. ''**You mean you can watch our news program from Miami???**''. Behar assured him that he not only could but frequently did watch the 6 PM newscast from Brasil via the INTELSAT feed which most readers of CSD now know is well received in the eastern 40% of the USA from a bird at 24.5 degrees west. ''**I have to see this myself**'' said the news type. ''**I'll do you one better**'' said Behar ''**When you** run **the story on me in Brasil I'll tape it here in Miami and send you a copy!**'' responded Behar. The news type muttered something in Portuguese that we probably couldn't print in this family publication even if Behar had understood it.

''YOU MEAN YOU CAN WATCH OUR NEWS right there in Miami?'' [If you don't think the Brasilians are fanatical about soccer take a close look at the 'O' in Globo!]

Many of the news stories bothered to check out Behar's activities with various US government representatives. A UPI wire news story that moved at 1722 hours on July 22nd quotes an FCC Attorney identified as James Keats as stating ''**More and more people are using these earth stations and picking up transmissions. It could very well be a violation of Section 605 of the FCC Act of 1934**''. Another FCC engineer quoted in the same UPI story admitted ''**The airwaves are free** (Behar said they were repeatedly when talking to the press) **but some signals are not meant for public viewing**''. He meant that you are supposed to have permission to tune in such signals.

Behar's response was classic. ''**Who am I going to call...the Russians...to ask permission???**''.

If Behar's activities focused attention of the reception possibilities with non-US satellites others less prone to creating publicity did their own thing quietly. Satellite Pioneer Lynn Hurd in Beaverton, Oregon laid claim to being the first person in the US to receive a Russian color signal. He managed to stay up all night when the Olympics started and armed with a 120 degree LNA, a 10 foot dish and a homebrew receiver he was able to get what he described as good looking color from Molniya shortly after the Olympics started by begging a few SECAM color monitor modules from his place of employment; Tektronix. Behar was also watching color, but not from Molniya as we shall shortly see. And not on a Tektronix monitor either; Behar found that because Miami is such an

international city he was able to locate a ready supply of combination PAL/NTSC/SECAM color RF **receivers** with switchable color standards on numerous retail shelves in Miami! We'll tell you about that also since he appears to have found a solution to at least a part of the multi-standards problem here in North America.

As Many As Six

Counting Molniya's single TV transponder it was actually possible for **some** North American viewers to tune in six different channels of Russian Olympics coverage all at once(!). If you are a careful reader of **CSD** you noticed a brief report on a new Russian Ghorizont bird operating at 14 degrees west in the August issue. That's where five of them were.

Ghorizont is the Russian 'horizon' bird. Yes, that means that it has a global beam pattern. And from 14 degrees west it can see quite a chunk of the earth as the coverage map here shows. Now there has been Ghorizont activity at 14 degrees west since mid-1979. The Russians launched Ghorizont **II** to that location in 79 and it was this bird that the Miami SPTS crowd was searching for when we stumbled onto INTELSAT at 24.5 degrees west last February. England's Steve Birkill has been keeping tabs on Ghorizont since it first appeared in the sky. When Ghorizont was first put into operation in 1979 Birkill noted that it had **perhaps five** transponders with video capability and one that was dedicated to SCPC data. The last full check Birkill made of this bird was in December in 1979; when he next looked in February the bird had lost **all but one** of its TV transponders and there was no SCPC data there anymore. Apparently sometime around the first of the year Ghorzont II blew a large portion of its powering system and to keep the bird active at all the Russians trimmed off everything but a single TV channel which they needed for western Russia. So in fact when the SPTS crowd was looking for Ghorizont in Miami the chances are quite good that it was only operational on a single channel or perhaps not operational at all at that precise point in time.

The Russians limped along with a sick bird at 14 west until late in June when they got Ghorizont IV into place at the same location. Steve Birkill spotted it almost immediately and advised us that the IV replacement was operating well and with stronger signals than the II bird. We in turn alerted several people along the eastern seaboard, including Behar and it took Behar only a few minutes to run his motorized 16 foot Paraframe to 14 west and tune in the multiple-channel signals.

"**My God...it is flat strong**" reported Behar excitedly. How strong we asked. "I think **one transponder is as strong as SATCOM FI here!**" was the response. Well now, this was more like it. Five channels of Russian relayed television, two dedicated to internal Russian service and the other three carrying a mixture of eastern and western European programming. Birkill reported seeing a wide variety of program feeds prior to the massive Olympics coverage (which dominated Ghorizont IV for two weeks) including a Hungarian rock show, native language French, German, Swedish and other programming including Italian. And with the kind of signal levels being placed all over its visible globe (40% of the surface of the earth) it looked as if REAL live European (and Asian) programming was finally going to be available in the western hemisphere!

Ghorizont IV's operational characteristics are not totally published so we must base our own assumptions on observations; many of which will come in over the next few months. It looks to Birkill as if all five of the TV transponders are in the **34 dBw** region **in England**. It looks to Behar as if Russian transponders 1,5 are in the 32 dBw region in South Florida with others down from 3 to 8 dB. The signals are right hand circular polarized. And the audio? Birkill found the normal program audio on the Russian standard 7.5 MHz sub-carrier. Behar found more sub-carriers operating during the Olympics with audio on 5.5, 6.2, 6.8 and 7.5 MHz. During the Russian transponder 5 feeds he found Russian audio commentary on 7.5 MHz, Spanish audio coverage on 6.8 MHz, English (!) audio on 6.2 MHz and some fourth language on 5.5 MHz. Yes, Behar was able to follow the English language commentary on Ghorizont IV just as if it were a US DOMSAT transmission. During some of the transmissions he even found multi-language titling or captioning on the sporting events on Russian transponders 1 and 5; including English.

MOSCOW OLYMPICS opening ceremonies as viewed in South Florida. You ought to see the original color in this! [NTSC never looked so good.]

WEAKER GHORIZONT IV transponders look about like this TR2 picture on a linear feed and 16 footer in South Florida. Say you're getting a 20 footer Roberto!

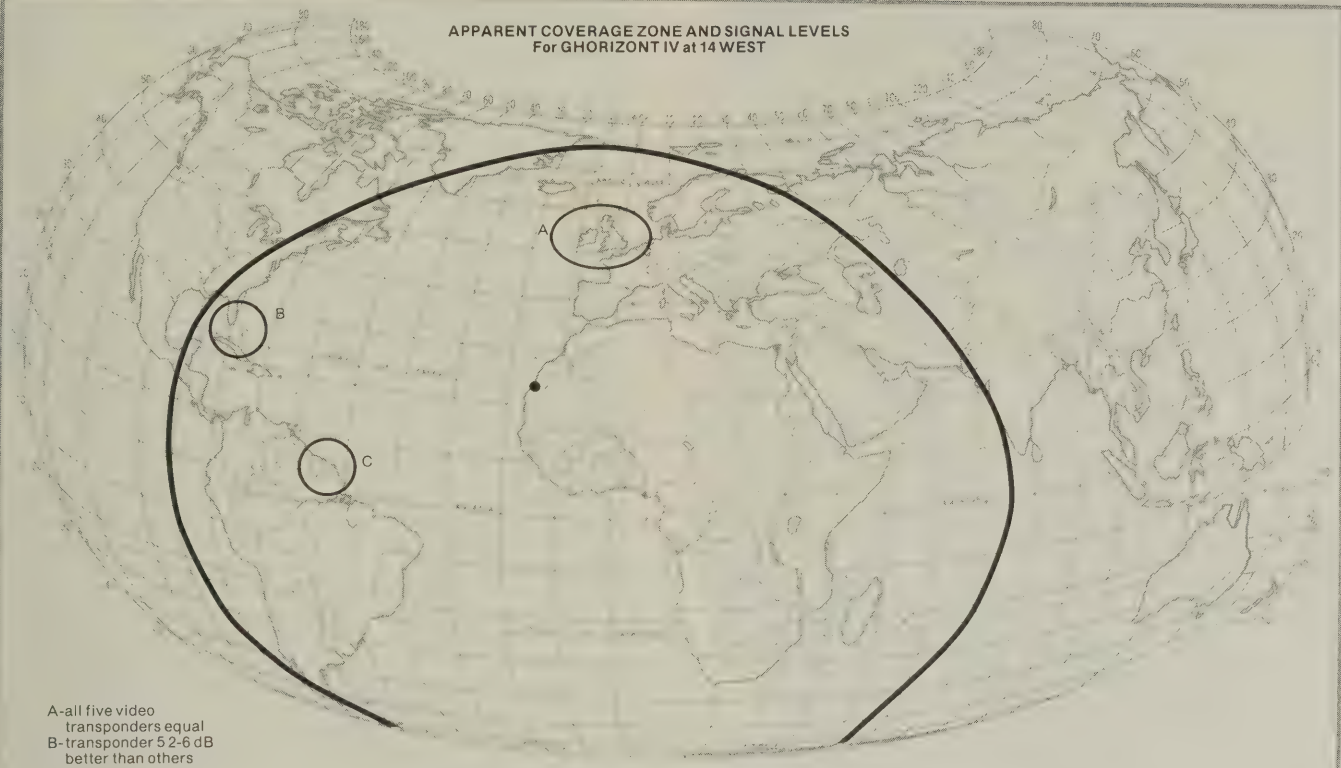
The signals on a 16 foot dish in Miami are strong enough that even with a **linear** feed the picture quality is very good; at least on transponder 5. We sent Behar down our 'Bic Pen' Chaparral right hand circular feed adapter (see separate report in this issue of **CSD**) and he reported that brought everything out of the noise except a couple of the weaker transponders.

The Russian Ghorizont IV channels are 50 MHz wide and they align as follows:

Transponder	Center Frequency	US Equivalent
1	3675 MHz	None
2	3725 MHz	1+
3	3775 MHz	3+
4	3825 MHz	6+
5	3875 MHz(1)	9-
6	3925 MHz	11-

1 - Same as Molniya channel.

APPARENT COVERAGE ZONE AND SIGNAL LEVELS
For GHORIZONT IV at 14 WEST



A-all five video transponders equal
B-transponder 5 2-6 dB better than others
C-transponder 5 1-3 dB better than others

Map based upon Global patterns and Observation Reports

IT IS A GOOD THING Behar's 32nd place street runs more or less east and west or he would never have gotten Ghorizont IV in over the tops of the buildings to his east! [Now that is a low look angle.]

MOTOR + CHAIN DRIVE on Behar's Hialeah 16 foot Paraframe dish.

YUP - that's you-know-who [second from right] applauding his team. Wonder where that door behind the dignitaries leads?

Now what can you expect to find on each? Well, remember that England's Birkill finds **all** of the signals **about equal** in level **in Europe**. Behar finds to the contrary in Miami and another observer on the northern coast of South America also finds to the contrary. This simply says that the Russians are playing some tricks with their Global beam patterns; some are 'canted' or semi-directionalized if what our two western hemisphere observers report proves to be universally correct (we believe it will so prove).

Transponder	Relative Signal Quality
1	**Very strong**, equal to 5 (+32 dBw estimated)
2	Noisey color signal, (+28 dBw estimated)
3	SCPC or no signals at all
4	Noisey color signal (+26 dBw estimated)
5	**Very strong**, equal to 1 (+32 dBw estimated)
6	Very noisey signal (+24 dBw estimated)

Keep in mind these are the Russian transponder numbers, not the US equivalents.

Now to the matter of recovering Russian SECAM (or European PAL) color from the IV bird (or Molniya as far as that goes). In the Miami area there are plenty of Sony model **KV2012ME receivers** on the open market. These sets are designed for use in the Caribbean and South America and they are multi-everything (110, 220 VAC). Behar **warns** people who acquire the receivers to pay careful attention to the isolated chassis construction; the antenna input is 300 ohms and it is isolated from the chassis with coupling/blocking caps. **Don't** attempt to go **directly** to the chassis tuner with a 75 ohm line!

This last observation. Behar noted that the Russians were 'renting' their bird to UPI News and the Independent TV Network (ITVN) after 6 PM eastern to feed brief film and tape footage of the day's Olympic events back to the US. Yes, that is an interesting **commercial** use of Ghorizont and it also says that someplace in the US there was a terminal (commercial) directed at Ghorizont. In fact if you saw ITVN or UP Olympic coverage during the games it probably got to the states in this manner. He also saw several hours of special feeds being sent to Cuba including two-way dialogue between the Cuban receive terminal operators and the Russian uplink terminal operators; all duplexed on a Ghorizont sub-carrier channel!

ANTI-PIRACY LEGISLATION TEXT

A BILL

To amend the Communications Act of 1934 to prohibit the unauthorized interception and use of subscription telecommunications and to protect the privacy of the users of such telecommunications.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled.,

That the Communications Act of 1934 (47 U.S.C. 15 et seq.) is amended by inserting after section 5 the following new section:

"UNAUTHORIZED INTERCEPTION AND USE OF SUBSCRIPTION TELECOMMUNICATIONS

"SEC. 6 (a)(1) Except as provided in paragraph (4), a person who...

"(A) knowingly carries out an unauthorized interception of a subscription telecommunication; or

"(B) knowingly attempts to carry out, or conspires to carry out, an unauthorized interception;
shall be liable for civil penalties under subsection (b) and shall be subject to criminal penalties under subsection (c)(1).

"(2) Except as provided in paragraph (4), a person who...

"(A) knowingly carries out an unauthorized interception of a subscription telecommunication; and

"(B) knowingly uses the subscription telecommunication for his own commercial advantage or financial gain, or for the commercial advantage or financial gain of any other person;
shall be liable for civil penalties under subsection (b) and shall be subject to criminal penalties under subsection (c)(2).

"(3) For purposes of this subsection, the interception of a subscription telecommunication by any person shall not be considered an unauthorized interception if...

"(A) such person is the originator of the subscription telecommunication, or his agent;

"(B) such person has agreed to pay a fee or charge to the person originating the subscription telecommunication, or his agent, for the use of the subscription telecommunication;

"(C) such person has entered into any other contractual arrangement or any other agreement under which such person is entitled to receive the subscription telecommunciation from the person originating the subscription telecommunication, or his agent; or

"(D) such person has reasonable cause to believe that such person is entitled to receive the subscription telecommunciation from the person originating the subscription telecommunication, or his agent.

"(4) The provisions of paragraph (1) and paragraph (2) shall not apply to any interception which is authorized under chapter 119 of title 18, United States Code.

"(b)(1)(A) Except as provided in subparagraph (B), any person who is aggrieved by any violation of subsection (a) may commence a civil action for actual damages, for damages under paragraph (2), and for equitable relief against the person who is alleged to have committed the violation.

"(B) No civil action may be commenced under subparagraph (A) after the end of the 2-year period following the date of the discovery of the alleged violation, or the 7-year period following the date of the occurence of the alleged violation, whichever occurs first.

"(2) Any person who violates subsection (a) shall be liable to any aggrieved person for damages in the amount of $100 per day for each day in which the violation occurs, except that any damages awarded under this paragraph shall not be more than $1,000.

"(3) In any civil action under this subsection in which the court determines that the plaintiff has substantially prevailed, the court may assess against the defendant reasonable attorney fees and other costs of litigation reasonably incurred, and the court may award, for a violation of subsection (a)(2), such punitive damages as it considers appropriate. Any punitive damages awarded by a court under this paragraph shall be in addition to any other damages or equitable relief awarded by the court under this subsection.

"(4) Any civil action under this subsection may be commenced in any United States district court of competent jurisdiction, without regard to the amount in controversy, or in any other court of competent jurisdiction.

"(c)(1) Any person who violates subsection (a)(1) shall be fined not more than $25,000, or imprisoned for not more than 1 year, or both.

"(2) Any person (other than an individual) who violates subsection (a)(2) shall be fined not more than $1,000,000. Any individual who violates subsection (a)(2) shall be fined not more than $250,000, or imprisoned for not more than 18 months, or both. If the conviction of the individual under this paragraph, the individual shall be fined not more than $250,000, or imprisoned for not more than 40 months, or both.

"(d) The penalties established in this section shall be in lieu of any penalties established in any other provision of this Act.

"(e) For purposes of this section:

"(1) The term 'basic telecommunications service' means that basic two-way switched voice telephone service which is provided as an interstate telecommunications service on the effective date of this section and which is provided on a universal basis to the general public. Such term includes any other interstate telecommunications service which the Commission, from time to time, determines by rule is recognized as an essential part of an efficient nationwide system of basic telecommunications.

"(2) The term 'interception' means the receipt of any subscription telecommunication.

"(3) The term 'subscription telecommunication' means any telecommunication, other than basic telecommunications service, which is intended for receipt in intelligible form only by a person who has agreed to pay a fee or

NEED PARTS...
Sat-tec's Got 'em!

70 MHz DEMODULATOR CARD

The Sat-tec D-1 demodulator is the last block in a TVRO system, it is where the 70 MHz IF signal is converted to video and audio. The D-1 contains a PLL demodulator, video processor (CCIR de-emphasis, 4 MHz low pass filtering and 30 Hz clamp), dual sound sub-carrier demod and AFC circuitry. The power requirement is small, 15 VDC @ 200ma., signal input is -20dbm @ 70 MHz. AFC will enable the user to lock most any VTO L.O. with no problem whatsoever. Video and audio outputs are a standard 1 volt p-p suitable for driving any monitor, VTR, or modulator.

SPECIFICATIONS:
Signal input: 70 MHz at -20dbm (22mv)
AFC lock range: greater than 5 MHz
Sound subcarriers: 6.2 MHz and 6.8 MHz fully independent
Video level out: std. 1 volt p-p
Audio level out: 1 volt p-p
Power requirements: 15 VDC @ 200 ma
Demodulator: NE564 PLL IC
Tuning voltage out: 2 to 13.5 volts
Tuning voltage in: 0 to 15 volts max.

D-1 Demodulator Kit $99.95
D-1 Demodulator PC board only $49.95

Part Number	Description	Price Each
Avantek GPD-1002	1GHz, 12 db gain TO-8 can amplifier, 15 VDC	$45.00
Watkins-Johnson V802	2.5-3.7GHz VTO, lower noise than Avantek types	120.00
Watkins-Johnson V705	600-1000 MHz VTO, lower noise than Avantek	120.00
Signetics NE564	PLL selected to operate at 70MHz	7.50
Vari-L DBM-500	4GHz mixer, SMA connectors	85.00
Amperex ATF-417	1GHz, 25db gain hybrid amplifier, 20-24VDC	19.00
Motorola MWA-110	400MHz, 14db gain, -2.5dbm	9.00
Motorola MWA-120	400MHz, 14db gain, +8dbm	9.75
Motorola MWA-220	600MHz, 10db gain, +10.5dbm	12.40
Motorola MWA-230	600MHz, 10db gain, +18.5dbm	13.50
Motorola MWA-310	1GHz, 8db gain, +3.5dbm	12.40
Motorola MWA-320	1GHz, 8db gain, +11.5dbm	13.50
Motorola BFR-90	3GHz F_t NPN transistor, 15db gain @ 1.2GHz	2.50
Motorola MRF-901	3GHz F_t NPN like BFR-90 but 2 emiter leads	2.75
Regulators: 7800 Series	5V, 8V, 12V, 15V, 1A TO-220	1.50
Regulators: 7900 Series	-5V, -8V, -12V, -15V, 1A TO-220	1.75
IF Transformer	10.7MHz IF can be padded to 6.2 or 6.8MHz	1.25
Tuning capacitor	10pf multi-turn for filters, PLL, etc	95
Coil form+can set	Nice coil form set for filters, good to 120MHz	2.00

Sat-tec Systems; Box 10101
Rochester, NY 14610; (716)381-7265

SELECT YOUR CATV SYSTEM
Satellite Programming
INTELLIGENTLY...

...with SAT-Guide

Twenty channels of programming today on FI, soon 35 on FI and D2. Keeping up with what is 'up', when, is almost impossible. Until SAT-Guide.

ALL FI programs on all transponders are listed in this unique programming guide to satellites. INCLUDES daily program listings PLUS monthly summaries of movies, sports and specials. Only $28 per year from:

SAT-Guide P. O. Box 1569
Division of Commtek Hailey, ID 83333

charge to the person originating the telecommunication, or his agent, and any other telecommunication incident to such telecommunication.

"(4) The term 'telecommunication' means any transmission, emission, or reception of signs, signals, writings, images, and sound or intelligence of any nature by wire, radio, optical, or other electromagnetic systems.".

SATELLITE POTPOURRI

CANADIAN UPDATE

The battle of words grinds on in Canada. The latest threat calls for a crack down on the use of satellite receive terminals in Canada **only where** such terminals are feeding Canadian licensed cable systems or broadcast (re-broadcast) transmitters.

The Vice-Chairman of the CRTC in Ottawa detailed in mid-July his agency plan to stop the 'illegal re-use of US domestic satellite signals' directed solely at those (Canadian) firms whose broadcasting activities are licensed by the CRTC. VC Charles Dalfen explained "**The commission is not interested in the mere reception of satellite signals nor interested in the earth stations that receive these signals when the terminals are supplying television to remote communities with no other service**". The CRTC now plans to prosecute approximately a dozen such terminals they have identified "**which compete with legitimate companies by retransmitting [satellite] signals**". As an aside those found guilty of such activities will be subject to fines up to $25,000.

Earlier this summer the CRTC, bowing to pressure from the Canadian cable television operator's association, vowed to prosecute any **and all** private terminals in Canada. This prompted Dr. Pat MGeer (Science and Communications Minister for the Privince of British Columbia) to arrange to have a 3.8 meter terminal installed on the front lawn of the BC Parliament building. Dr. McGeer in effect challenged the federal government to shut down 'his terminal first' before it began picking on the estimated 200 such terminals now operating in British Columbia alone. Dr. McGeer has repeatedly said "**Satellite broadcast reception is the best entertainment opportunity Canadians living in remote communities ever had and it is time people living in these communities had some support and encouragement**".

Dr. McGeer has apparently been one of the few people in North America to actually check out the status of the purported agreements affecting such 'international' reception. His comments on this are instructive to not only the Canadians but Americans as well who fear what their legal jeopardy may be in privately tuning in Canadian satellite signals or other 'international' signals. Dr. McGeer: "**I have carefully read both the INTELSAT agreement of 1971 and the exchange of letters between Canada and the United States in 1972. These documents are silent on the question of personal reception of satellite broadcast signals except for the United States letter to Canada which suggests that interchange** should **be encouraged. I hope that Canada will pursue this** (US) **suggestion by encouraging American viewers to watch broadcasts on ANIK satellites!**".

The subject of illegal (their word) reception of US DOMSAT signals by Canadian private (and community) viewers has attracted a tremendous amount of press in Canada. And most of it is appearing in general circulation newspapers and magazines. Charles Dalfen of the CRTC estimates there are between 700 and 1,000 such dishes in Canada operating today. Nobody seems to know for sure how many there **really** are. The BC government encourages them and the Manitoba provincial government actually gives them away to TV-less communities (!).

Most Candian observers and most Canadian government officials now seem resigned to this thought; **nobody** is going to bother **private home owners** who are operating terminals (in fact a recent CRTC announcement could be interpreted to mean that such terminals are now approved). Nor are community-owned systems where there is no 'profit motive' likely to face a close down. Some still mutter that these

LOW NOISE AMPLIFIERS
MAJOR BRANDS-Low Prices-Write!

3.7 — 4.2 GHz DOWNCONVERTER

7 - 4.2 GHz in, 70 MHz out
te. one control tuning
ersion - stable
ested $895.

Pola Feed Rotation

THIS PRODUCT NO LONGER AVAILABLE

•Teflon PC Boa... 4"
$14.00

•Chip capacitor kit 12 ea... ...0, 470
pf ... only $18.00

•SMA and Type N connectors

•.141" Semi-rigid coax $3.45 per foot

•2"x14" copper tube for Birkill feed. $12.00

SATELLITE INNOVATIONS
P. O. Box 5673, Winston Salem, NC 27103

Add $2.00 shipping and handling.

GENUINE HOWARD TERMINAL PC CARDS

Bob Coleman and Tay Howard are now producing six PC cards which make duplication of the Howard Terminal (latest version) a snap!

(A)Dual Conversion (4 GHz to 70 MHz) - $25.00
(B)70 MHz IF and Filter - $25.00
(C)Howard Demodulator - $40.00
(D)Dual (2 channel) Audio - $25.00
(E)Single Channel Audio - $15.00
(F)AFC and Metering - $15.00

These field proven and tested high quality boards are available as a five-board-package for $99 package price (you receive A,B,C,E and F above). Included is complete documentation for construction and a list of parts stocking distributors.

Order from: Robert M. Coleman, Rte. 3, Box 58-A
Travelers Rest, S.C. 29690

terminals **should be watching** Canadian signals, not American signals but the logic of that disappears when it becomes apparent that southern Canadians have either direct or cable access to US programs while their more northern cousins are lucky to have access to **any** programming.

And so it appears, for now at least, the way is clear for most Canadians who want private terminals or those scattered communities who want to install a non-profit terminal system to do so without fear of government reprisals. Earlier this summer Canadian newspaper writers were warning readers to '**Lock Up Your dishes - Here Come The Cops**'. The tide has turned and Canada seems resigned, to the fact that you can't block satellite signals at the borders nor can you deny remote citizens access to their programs unless you are willing to offer alternatives. And for the time being the cost of offering alternatives is apparently far beyond the reach of the Canadian budget so reception of US satellite signals will move ahead with**out** government interference.

PROGRAMMING CORRESPONDENCE

UP AND RUNNIN' IN D.R.

I attended the SPTS '80 meeting in Miami this past February and thought you might wish to know what progress we have made since that time. Initially I constructed a 16 foot dish, equipped it with the Microdyne X1 receiver and a 100 degree K LNA. With this installation I get excellent pictures on COMSTAR D3, a signal with slight noise from SATCOM FI and pictures with quite a bit of noise from COMSTAR D-2 and WESTAR I. More recently I have installed a pair of systems for customers utilizing the 16 foot STARVIEW dish and similar electronics with identical results. I am now starting construction on a 24 foot diameter dish for a local customer and I hope this will be the solution to eliminate the noise spikes found still on FI with a 16 foot antenna. When I have finished I will send to you my results for publication in **CSD**. Can you tell me (1)if in the near future COMSTAR D3 will be carrying more video (it now only has the Saturday afternoon baseball game sent to Puerto Rico with an audio subcarrier on 5.8 MHz), (2)where I can get an 80 degree Kelvin LNA, (3)when the amateur group that discusses satellites operates and where(I am HI8BLF), and, (4)where I can obtain a less expensive down converter that can be coupled to the Microdyne 1100 (X1) receiver to avoid down line losses?

Vinicio Lembert
Santo Domingo
Dominican Republic

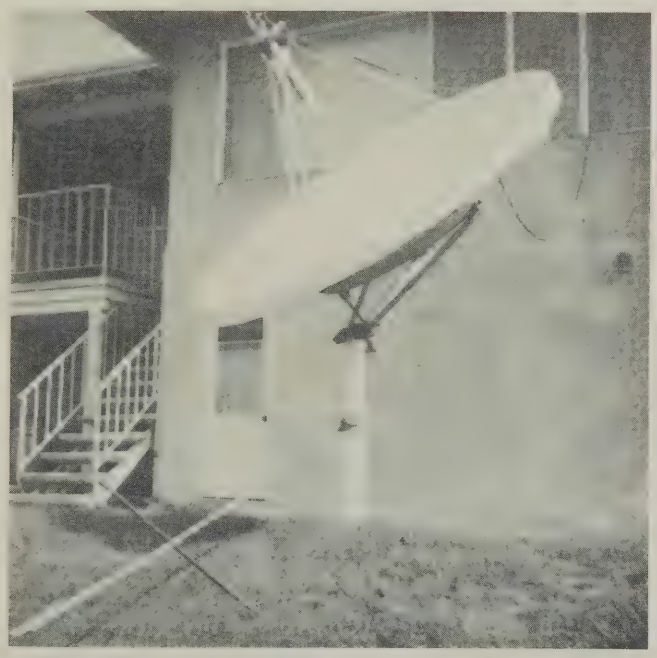
Delighted to see your attendance at Miami SPTS has put you into the TVRO business in the central Caribbean! D3 is not **likely to have heavy TV use in the near future although D2 [which you said has much noise] is expanding to perhaps 10 or so channels of cable TV service during this fall. WESTAR 3** (which you did not mention) **now has several cable TV channels and it may have up to five or so by the middle of next year. Until FIII launches and is operational late in 1981** (with perhaps another 2 dB or so of signal in your direction) **FI will remain your best bet. 80 degree Kelvin LNAs are very difficult to find but Amplica** (950 Lawrence Drive, Newbury Park, CA 91320) **and Avantek** (3175 Bowers Avenue, Santa Clara, CA 95051) **both have them from time to time. Sit down for the price however - typically over $3,000. The ham group continues to meet on 14.311 on Sundays at 1800 GMT** (1900 GMT later this fall after daylight savings time ends). **You might catch Coop this fall from the Caribbean as VP5D** (or VP5DX) **on most any HF band or even two meters. Tacking an outdoor down converter at the antenna, ahead of the 1100 Microdyne, is feasible but probably not a terribly good idea. You'd have to go into the Microdyne at the IF** (matching the output of your antenna-mounted down converter) **and run tuning voltages outside to the down converter. Another approach is the complete 'everything at the dish' receiver which STARVIEW Systems now has available.**

QUICK TO START

I thoroughly enjoyed SPTS '80 San Jose, meeting the Coopers, the exhibitors and shoppers like myself. Enclosed you will find some snapshots of my new, operating earth terminal. Thanks to the 'SPTS '80 Price War' on most items I got started in a big hurry. I am having a ball tuning in all of the satellites to the south and southwest from my location and surprisingly if I have my antenna pointed right on the button I have almost non-existent sparklies with the following equipment: (1)Andrews 8' parabolic, (2)Avantek 120 degree LNA, (3)Chaparral 'Super-Feed', (4)Alliance U-100 rotor, (5)ICM receiver with AFC (the 4200 and remote package), (6)Radio Shack TV Interface modulator and power supply kits and about 20 feet of RG-214. The manuals I obtained at SPTS '80 San Jose are really excellent; they are the 'Coop's Satellite Operations Manual' and 'The Gibson Satellite Navigation Manual'. Some of the single sideband signals encountered while 'tuning around' were explained very nicely in the Coop's Manual and it solves a lot of wonderment on my part. I think they are both worth at least $100 each!

C. Munnell
La Mesa, CA 92041

Steve Gibson's Navigation Manual outsold all others at San Jose with Nelson's Parabolic and Coop's Operations Manuals a strong second. And who says you have to have a 12 foot antenna in California!



MUNNELL's 8 foot Andrew dish.

FIBERGLASS ROD AVAILABLE

I was very pleased with your efforts with my new Manual and I enjoyed your comments on starting 'cottage industry' by building dishes. Judging from the telephone queries and mail already arriving, dozens of people have already gotten the bug. One of the things I am hearing from users of the Manual however is that the fiberglass rod called for in the Manual may not be universally available throughout the United States. If you wish to suggest to your readers a US source for the fiberglass rod by all means go ahead and do so. I do not personally know of one. Fiberglass of Canada, who supplies the rod to us, just went up 30% in pricing and I understand resin prices are also going up. For those users of my Manual who need small quantities of the rod, we can supply a 3 meter length (9'7'') of the 3/8'' rod for $5.00 and a similar length of the 1/2'' rod for $7.50 as long as our price stays the same. This is in Canadian funds which means US dollar orders will be lower by the then current exchange rate. Shipping is on top of this.

Now that I am back in Montreal my first efforts will be directed towards a new feed system. I was nothing short of overwhelmed by the observed difference in feedhorn performance at San Jose and was extremely impressed with the performance of the Lindsay 'Scalar' feed.

Nelson Ethier
Comm-Plus
3680 Cote Vertu
St-Laurent, Quebec H4R 1P8
Canada (514-337-7255)

Nelson also has a fantastic supply of N type fittings which he is willing to part with to those builders who need a few of this and that. Other than one chap in Vermont who took exception to some of the formula-math work in Nelson's new parabolic antenna Manual we have heard nothing but praise for his straight-forward approach to building high quality antennas in your garage. How many 'new' antenna suppliers will be exhibiting at Houston in November because they bought one of the Nelson's new manuals and went into business for themselves?

HIDDEN DISH?

In regard to 'hiding' a home TVRO antenna, could you do an article in **CSD** telling us what types of materials are opaque and which type impede the flow of 4 GHz signals?

Art LeMay
Hope, British Columbia

Bob Luly during SPTS San Jose told us he had placed his 10 foot Umbrella antenna inside a number of enclosures to test what materials degraded 4 GHz signal flight. He notes that virtually any fiberglass material (such as you would purchase to enclose a backyard green or hot house for example) **or styro-foam blocks up to a foot thick** (he couldn't locate any thicker) **seemed not to block 4 GHz energy at all; even when the signals entered at a 'cutting angle' through the material. We'd publish some hard data if somebody would provide it in common sense layman form. His $395 JC Penny 'Dome Tent'** (with plastic interlocking support tubes) **certainly didn't hurt the 4 GHz signals any!**

EYE OPENER

I would just like you to know how impressed I was with SPTS '80 in San Jose. I must admit that I was a little apprehensive about your claims prior to the show. Now however I know you should have been even more optimistic in your projections. Over the years I have been to many, many conventions. This was by far the best! Your program, the pre-planning for the hotel and MATV system playback, the exhibits and the whole atmosphere was designed and implemented in a totally professional manner. While you had projected a large number of MATV hours my wife had to make a trip to downtown San Francisco to get another case of VHS videotape. Two recorders and some 23 four hour tapes later the entire program was recorded. I too was surprised at the make

THEY CALL THIS BIRD MOLNIYA

A whole family of Russian satellites circling over North America and beaming live Russian television back into the USSR. Now because STT has researched the Molniya reception challenge and developed hardware modifications and software systems to produce high quality Russian television throughout North America, you can share in the excitement of this ultimate 'real' fantasy!

Until you've seen Russia's approach to national television you cannot appreciate how lucky we have a multi-channel network of our own!

STT has put together a (approximate) special video tape that shows in great detail how you see the Russian Molniya transmissions, the technical changes required and the understanding of the unusual inclined-orbit of the Molniya series birds is explained in this special tape.

PLUS - this tape includes a report on the San Jose SPTS reception of Molniya **and** an interview conducted at STT in mid-July with English experimenter Steve Birkill who pioneered reception from both Molniya and Russia's Ghorizont Clarke-orbit birds.

STT videotape THS-1 is available for immediate shipment. Specify VHS or BETA format. Price $60 postage paid US and Canada; $65 (US funds) outside of US Canada.

STT P. O. Box G, Arcadia, OK 73007 405/396-2574

THIS PRODUCT NO LONGER AVAILABLE

up of the people attending the Seminar. I was rather surprised to see that most people were only talking and not buying or making any firm commitments. This was not the case as far as we were concerned. We did establish firm dealer-manufacturer relations. I even called one of my partners to make an unscheduled 380 mile one way trip to drive the Starview 10' dish on the trailer mount. We bought this demo unit as well as several other items and we are now totally operational having, since SPTS, made some significant contacts to potential buyers.

In my opinion SPTS San Jose was a total success. We were there the entire time from early Thursday to late on Sunday night. It was an exhausting few days that was totally worth the time and effort involved. I look foward to another SPTS!

Dan W. Weggeland, Snr. Partner
Instructional Media Associates
Palo Cedro, CA 96073

As a person who knew little or nothing about TVROs I came away from San Jose with a wealth of knowledge. The organization of the meetings, 2 per hour, with ample time for meals, displays and talk, made the time a very rewarding experience. Your use of 'TV' to keep us informed and in particular the daily 8:07 (AM) live program got me up and really fired each day. The sharing of information by the speakers as well as the other participants added to the quality of the San Jose workshop.

I can go on and on with superlatives but the thing I came away with that so impressed me was the creative, give it a try atmosphere! People trying new things, learning, sometimes failing and then trying again. I am very interested in getting into satellite conferencing and so after attending the workshop and talking with people it seems very possible. It will require getting out there and talking up different delivery systems but I now know it can be done. Thanks for the creative experience!

Terrence J. Thompson
TSB Communications
Belcourt, ND 58316

We promise to keep SPTS/SBOC events creative and energy charged. The forth coming November 17-18-19 SBOC in Houston will shift emphasis slightly to the business opportunities of all of this but in doing so we expect to bring in new minds that we haven't heard from before. Can you imagine having Ted Turner stand up there and tell us all what it takes to crack the media giants over the head and how to do it yourself? That's the approach we are taking with Houston and we look forward to seeing all of you there.

A FREE SUPER UNLINK?

I would like to take this opportunity to thank you and your collegues for a most enjoyable SPTS. This was my first and it will not be my last! As you may recall I spoke briefly with you about the NASA-Rosman facility. This North Carolina installation of NASA is scheduled to close on 1 January. It is imperative that somebody get on the ball **now** to figure out a way to keep it active so that groups like those attending SPTS in San Jose can have access to a modern, fully operational uplink system. This is a 600 acre site on US National Forest property. When this space facility was fully operational it employed a maximum of 300 people and had an annual operating budget of around $5 million.

Since NASA and the US Forest Service both would like to see the facility kept open, it is 'on the block' for any group that can come in and run it; they only need to maintain it in operating condition. Lacking that kind of arrangement it will be torn down and that will be the end of that. I can envision a users consortium taking over the responsibility for running it and making it available for uplinking to other user groups for just the costs of actual use. This might be a less than 24 hour per day operation under those conditions and could get by with ten or fewer people. The site is superbly equipped with a pair of 85 foot dishes that even have Lunar ranging capability. The whole facility could be used for everything from uplinking to engineering training to research in basic low cost space technology.

Governor Jim Hunt has written to President Carter suggesting that the site become a Center for International Studies. We are presently working with the Governor's office here to try to get their full support. Under consideration is a national teleconference to show a large number of potential users the full facility. If we could put together such a teleconference we think **CSD** readers could be local 'missionaries' to show off the teleconference to local educational institutions and other people who together might be able to save the site and put it to good use.

We noticed an article in a recent **CSD** about the formation of a national (or international) users network or group. This site could be the uplink for that purpose but we need to get moving on it now to either work out a plan before 1 January or stall the close down until something can be worked out. What do others think?

Mike Eastern
Assistant Director
Interworld, Inc.
112 Terrace Avenue
Elkin, N.C. 28621

We think this has so many possibilities that it might take a very long time to even zero in on the basic **problem; keeping the uplink operational. Mike is telling us that a major US facility is closing down; that Uncle Sam wants to lock the doors and walk away leaving a pair of 85 foot antennas plus buildings filled with uplink and receiving gear for the rats and squirrels to inhabit. We also think that with the onrush of space this approach stinks. Mike broached the problem to the SPACE Board of Directors in San Jose and they appointed a two man committee** (Robert Coleman and Ralph Payne) **to look into it. But SPACE is up to its earlobes in HR 7747 alligators at the moment and the timing is not good for our new trade association to help out on** this **one. Out there are several thousands of creative readers. We suggest that an ad hoc**

SATELLITE TV RECEPTION MADE EASIER!

For those who are working with the Coleman or Howard TVRO system Manuals, here is a selection of PC boards, kits or assembled units which will get you 'up' and 'on-air' much sooner!

The follow...boards piggy-back to our LNA amplifier a...mixer boards to provide you with regulated ...for the important low noise amplifier

Model	PC Board Only	Kit	Wired/Tested
MRR /	...00	$10.	$20.
BSAF		$10.	$20.
FDAb		$20.	$30.

To recov... pair of systems designed ...z tuning for subcarriers. ...sted, specify subcarrier freq...nt for easy 'stacking'/switc...

Model	PC Bo...	...Tested
SAA-2	$3....	

If you are fighting the b...IF system **with** a built-in de...3 RF remodulator, here's yo...add audio, order one or more SAA boa...HOWARD Manual required.

Model	PC BOard Only	Kit	Wired/Tested
70HIF	$10.00	$150.00	$300.00

All boards are supplied with complete data for construction. AND - call or write us about our NEW TVRO receiver!

ROHNER MACHINE WORKS
John P. Rohner/7th & Elm Streets
W. Liberty, Iowa 52776
(319-627-4212)

THIS PRODUCT NO LONGER AVAILABLE

committee be formed instantly; just anybody interested **in trying to figure out how such a giant facility can be saved and put back to work. We will support you here in** CSD **by spreading the word and even sponsoring a 'Save Rosman' fund. By the time we get to Houston's SBOC you guys can hopefully have some solid suggestions worked out and have the exact cost of saving the site on a shoe-string budget worked out. If you do we'll make room on the SBOC program in Houston for you to present it to the rest of us.** Call Mike **at 919-367-7251 or 835-7226. Saving whales is neat;** saving dual-85 foot uplink equipped sites is exciting!!!

UHF MODULATOR?

I have nothing but high praise to offer for **CSD**. Finally there is one darned good source to learn up to date information about satellite television technology as well as the business angles that are developing. I would like to see in the near future a construction article for a high quality visual-aural modulator with output in the UHF band (i.e. channels 14-83). Some requirements would include crystal control, vestigal sideband filter, 75 ohm output at about +50/55 dBmV. This is probably a tough assignment but I feel there is a definite need for such a device especially in an area where all 12 VHF TV channels are already filled (cable TV) and supplying mid or super band converters would be cost prohibitive.

N.A. Anderson
Anderson Electronics
Red Wing, MN 55066

Triple Crown Electronics (42 Racine Road, Rexdale, Ontario, M9W 2Z3, Canada) **does have a UHF modulator** (write Charles Evans there). **One possibility might be to take a VHF modulator and mix the output up to a UHF band channel with all of the sideband filter and good quality stuff at VHF** (or i.f. as is the practice today). **Getting +50/55 dBmV at UHF after conversion would be the trick although there are a number of solid state linear amplification devices on the market which could be made to do that job** (and several dB more...like watts). **Here is a project for a reader that could probably be turned into a saleable product in short order. Who wants to tackle it?**

NO LNA

I am in the process of building a home TVRO and I would like to know if in mid-Oklahoma it is possible to get a picture with NO LNA? I would start off with the mixer, LO, IF and baseband section and then add the LNA later on.

Larry Park
Oklahoma City, OK 73112

With a 10-12 foot antenna in the central portion of the United States it is possible to see sync and perhaps the outline of a picture with a typical VARI-L DBM500 mixer on the WESTAR I and II birds. But when you add your first couple of LNA stages there will be all of the difference in the world!

MOTHER FANS

I have recently read Coop's interview in the Plowboy section of the May/June MOTHER EARTH NEWS and I applaud the effort. I've been in the production end of this business of broadcasting for 18 years, read a number of trade journals, and I have never had the technical aspects of the satellite TV developments laid out before me so simply and clearly.

Jerry A. Johnson
General Sales Manager, KICT
Wichita, KS 67235

I read Bob Cooper's interview in MOTHER EARTH NEWS with great interest. I am a student studying elecronics while incarcerated at the Fort Grant Training Center. We would like to put a satellite system in because we are so far out in the mountains that what little reception we do receive is very weak. Our fund however would never allow such an installation so I am writing on behald of all of the men here to see if you can help us locate a firm that would be willing to donate to us a small system. Such a donation would be tax deductible under 501C3 code of the IRS, and the system would belong to the institution. Another option, perhaps, is to set up a system here for the publicity.

Steve Griffith
39708
Box R4000
Ft. Grant, AZ 85643

While we doubt there are any suppliers looking for a 501C3 tax donation or publicity to sell terminals, we appreciate your interest. Certainly a lot of interest in terminals for 'points of incarceration' these days!

BIG STUFF IN PANAMA

I would like to pass along some information for anyone in South or Central America. Here in Panama there is already a working TVRO. It has an 11 **meter** (that's not feet folks!) dish and redundant cooled parametric low noise amplifiers; 33 degrees Kelvin. With this super equipment it can only receive about ten of the transponders on SATCOM FI and 2 transponders on F2. Anyone south of Costa Rica ought to be very careful before buying a TVRO since this experience indicates that at least for SATCOM transponders the going is rough. The system mentioned, by the way, is planning to upgrade to a 15 meter dish and even then they may not be able to receive all of the FI transponders. As an aside, the 33 degree K LNAs cost them $40,000...each!

Martin Duffy
Giroelectronica, S.A.
Panama, Panama

Panama is so far outside **of the forecast or measured FI and F2 footprints that even RCA refuses to guesstimate the signal levels likely. Outside of the 26-28 dBw contours an effect known as 'ridging' takes place, the result of transmitting antenna sidelobes. Very small distances on the ground can make big differences in the signal level with 'hot' and 'cold' ridges interspersed. The lucky ones get a ridge** (which most likely will only be for one or two of the six-channel antenna sets on FI or F2) **and the unlucky ones get the opposite of a ridge which is a null. The same effect is also apparent on the COMSTAR birds although WESTAR and ANIK don't seem to have it, possibly because of their less complicated downlink feed horn arrangements on their respective birds.**

REF SWAN POINTING

Your Radio-Electronics article (February 1980) recommends aiming the Swan antenna boresight at a point 118 degrees west. Using my own position in Denver and the +/-20 degree boresight angle variation, a Swan here would see the satellites parked from 105 west to 132.6 west, not 98 to 138 as you state. Aiming the antenna at 116 west and designing the mount to allow a +/-10 degree rotation of the reflector then satellites parked between 95 west and 139 west can be monitored. I believe the difference between the antenna viewing angle (+/-20 degrees) and the portion of the orbit seen will increase at the ground station approaches the equator, thereby requiring greater antenna mount movement to see the same portion fo the satellite orbit.

Dennis Trusty
Evergreen Co.

Most of the Swan design antenna advantages are lost when the feed and the LNA must be as much as 7.5 meters above ground which is the case when we have nearly vertical pointing angles here in the tropics.

G. Presley
Christmas Island
Indian Ocean

While it is possible to tilt the reflector surface to create an

angle-of-arrival/angle-of-release relationship to suit your particular feed location desires in most latitudes, close to the equator as well as close to the pole[s] you certainly do lose that advantage. Close to the equator the antenna feed would indeed have to be high above ground while close to the pole[s] just the opposite would be true.

APPRECIATES THE IDEA

By an odd coincidence your kind suggestion appearing in the March issue of **CSD** that the geostationary orbit belt be re-named after the undersigned arrived in the same mail with my annual quarterly dividend check from COMSAT; $2.05. Need I say which gave me the most pleasure?

Arthur C. Clarke
Colombo, Sri Lanka

At $2.05 per quarter Arthur will be saving his dividend checks for quite some time before he can acquire his own 'private terminal'. We suggested in our December CSD **that some sharp equipment supplier ought to jump at the opportunity to go to Sri Lanka and supply Arthur with a 'donated' TVRO; in exchange for the right to advertise that the 'father of satellites' receives his television on an 'XYZ Terminal'. We've heard from two such suppliers since then; and if everything goes OK several of us may drop in on Arthur this coming spring to install a terminal for him there. Boy, will that make a neat report for** CSD!

BIRD OPERATIONAL NOTES

LATEST COMSAT rumors suggest the US representative in INTELSAT may be having second thoughts about the DBS business afterall. Primary problem appears to be COMSAT's inability to attract a partner in the venture. Best bets are that this may well drag out in state of limbo several more months if not years.

FCC meanwhile has begun formal process of preparing for 1983 'Hemispheric Conference' that will follow up on WARC '79. Commission must evaluate what US needs are likely to be in DBS area through 2000 or further, create program to fit DBS into those forecasts without stepping on toes of other western hemisphere nations who perhaps have far greater need for orbit space and DBS service than US can justify. All of this is at 12 GHz of course.

LOOK FOR early start of 73 hour weekly feed interconnecting new STV stations owned by media giant Gene Autry this fall. Autry's firm is firing off new STV outlet in Oklahoma City with others for Omaha, Memphis, Dallas and Chicago close behind and he will use WESTAR bird to send first run R and PG movie fare to each station from west coast uplink site. Service will be called VEU.

FCC decision to allow cable systems to carry any programs they wish from any stations they wish **could** signal new rush to birds by indie stations; **but don't bet on it**. FCC lifted rules that required CATV systems to take service from indies closest to them during July but attitude of most cable firms seems to be that they would rather load up their channels with non-broadcast signals (i.e. such as Nickelodeon) than more indie signals.

With **HR 7747** now before House for action FCC has jumped onto bandwagon; addressed subject in July and said it didn't like concept of piracy and would support legislation.

LATEST study by popular news weekly **Satellite Week** reports WTBS is most viewed satellite service (nearly 9 million US homes plus who knows how many in Canada!) while Christian Broadcasting Network (CBN) is not far behind at just over 8 million homes. CBN with **CSD** is sponsoring automatic 'registration' for approved satellite viewing (see this issue of **CSD**).

A CANADIAN group called Cablecom Corp. (8-1540 Alberta Avenue N., Saskatoon, Sask. S7K 1R6) is promoting national Canadian registry of private viewers who are watching SATCOM services. Firm hopes to collect funds from each on a voluntary basis and then see that US programming sources get paid for viewing.

IN SPITE OF blockade by US and partners against Moscow Olympics INTELSAT reports it had over 1,000 hours of 'time' booked for relay of game events to various nations around the world. Not reported was the amount of time 'sold' by Russians on Ghorizont series birds; as a report in this issue indicates at least Ghorizont IV was loaded daily and simple math suggests that hour total may be have exceeded 500 hours over two weeks of games. Russians probably charged less than INTELSAT for their relay (to Cuba, etc.) but one US network decided **not** to use Ghorizont after Russians wanted $78,000 for around an hour per day of feeds for two weeks.

Latest MOLNIYA bird launched went into orbit in mid-July according to European sources. Russians are known to keep several extra MOLNIYA 3 type birds in inclined orbit just in case one quits and they routinely retire them as early as three years after launch. One US observer reports he has found the Moscow-Washington hot line channel at around 3775 MHz; signal is typically 'tone' modulated.

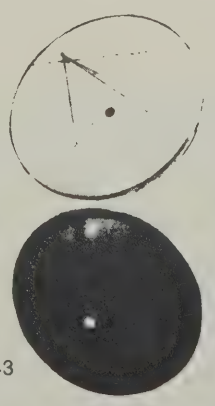
PROSPECT of major channel changes on SATCOM, prior to late '81 launch of III-R, shaping up. SHOWTIME planning to add new type of service early in 1981, and will take transponder 17 back from Eastern Microwave that currently sub-lets for WOR. WOR will have to move to COMSTAR D2 at that point. HBO's CINEMAX service began service on transponder 20 1 August; mostly odd collection of specials, movies previously released on HBO regular service. CINEMAX will expand to transponder 23 for western US feed 1 September; low priced Take - 2 service ceased operating on 23 on 1 August also. TRINITY's transponder 13 on FI continues to be bad as much as it is good and Trinity/KTBN now set to feed dual on D-2 as well as FI. Several additional new services are rumored in cable arena; Las Vegas Entertainment Network to start regular service D2 (transponder 10, **vertical**) 1 September. The fall period promises to be a real battleground for various new services on D2 and WESTAR III who want to grab limelight from FI offerings.

ANIK B 12 GHz experimental service has expanded to Ontario with a new 'TV Ontario' feed. Fewer than 50 homes are believed equipped to receive service however. 'TV Ontario' is educational service.

Now available at an affordable price...

PARABOLIC REFLECTOR ANTENNA

Big 10 ft. diameter fiberglass construction with 4 petals and center section. Bolts together easily in 45 minutes. Focal length 48.6, F/D Ratio .4, Gain 39db. Weight 185 lbs.
Reflector only $680.00.
In lots of 10 $585.00.



MINI - CASAT
RT. 3, BOX 160 FULTON, MS 38843
601 862-2132

Available Soon

PARAFRAME ANNOUNCES...

The First Remote Control Unit With L-E-D DIGITAL DISPLAY!

And it can be interfaced with your receiver!

THE RCU-24. It's all you'll need in your viewing room besides your TV set. Part of the story: ☐L-E-D DIGITAL transponder display ☐Operable anywhere in your house ☐REAL armchair convenience.

For details contact an authorized PARAFRAME products dealer, some of whom are listed below:

Jerry Peake Company, Inc.
Silver Spring, MD
301-587-2515

John L. Davis
Pocatello, Idaho
208-232-2606

Mid-Continent Earth Stations
Lincoln, Nebraska
402-476-2211

Satellite Systems of Illinois
Steger, IL
312-755-5400

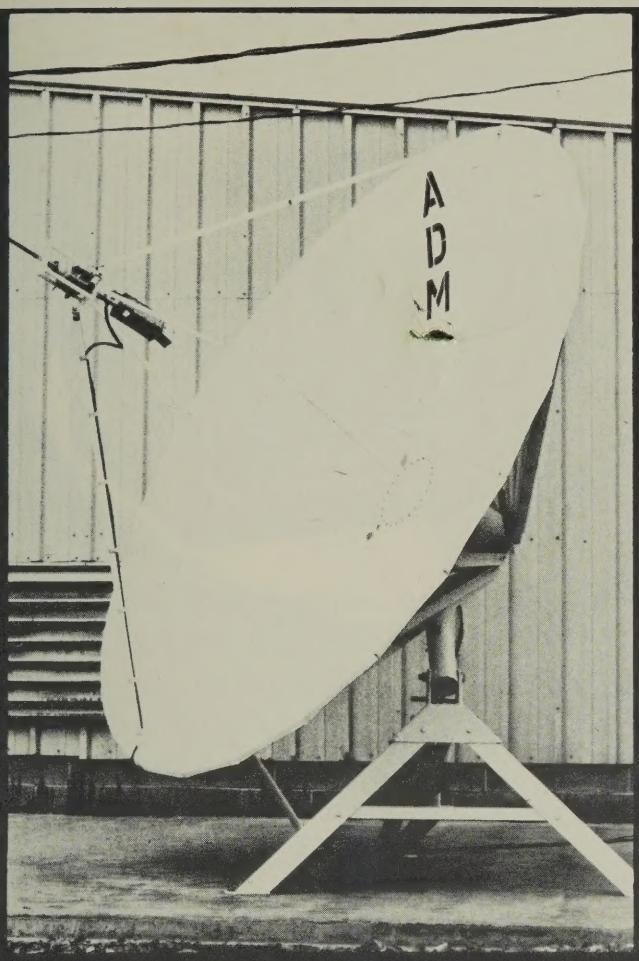
PARAFRAME

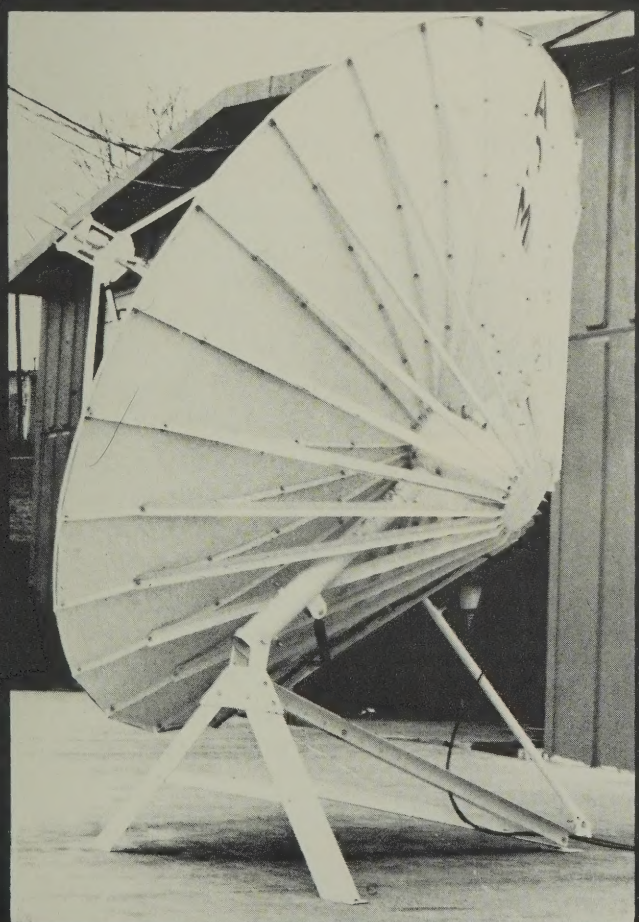
PARAFRAME antennas are adjusted **on site** to conform to the Paraframe Proofing Template. That is how you can guarantee your customers **maximum real world gain**. To learn how to become a protected PARAFRAME Products Dealer, contact:

Bob Christofanelli
Satellite Systems of Illinois
P. O. Box 68
Steger, IL 60475
(312-755-5400)

PARAFRAME

P. O. Box 423
Monee, Illinois 60449
312-534-7435





ANYWAY YOU LOOK AT IT...

ADM HAS YOUR ANTENNA!

AND YOUR TVRO SYSTEM. Rapid delivery on ADM's super-efficient 11 foot polar mount antenna (includes remote controlled polarization rotation system as well!), plus, packages are available for complete systems including LNA, 24 channel tuneable receiver and cabling. Why wait in a long line when you can get the best, today!

A SUPER TVRO ANTENNA SYSTEM. High quality panelized aluminum 11 foot dish and steel polar mount. Dish weighs approximately 200 pounds, mount 265 pounds. Precision designed, easy installation, zinc chromate base primed and heavy duty white top finish. The rotating feed is standard! Easily shipped and installed. Choice openings for dealers and distributors.

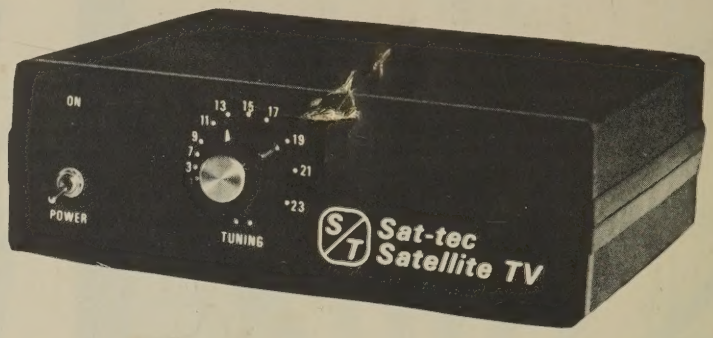
Antenna Development & Manufacturing, Inc.

P.O. Box 1178
Poplar Bluff, Mo. 63901
(1-314-785-5988)

Sat-tec THE LEADER IN LOW COST TVRO

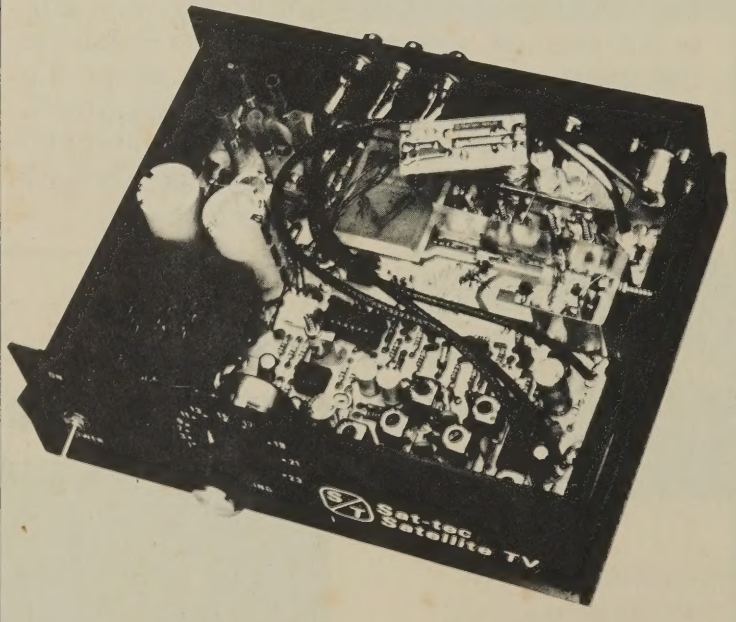
Introducing the R2 Satellite Receiver

A TV Satellite Receiver with all the features you need, at a price you can afford.



The Sat-tec R2 receiver is a versatile, consumer oriented unit designed for volume production. Easy operation and a clear, simple format makes the R2 idea for any application where non-technical users are involved. Fully frequency agile, the R2 may be used on 12 or 24 transponder birds, and since the tuning is continuous, foreign satellites such as Intelsat and Molniya can be received. A high performance AFC keeps the tuning accurate and sharp, fine tuning is not necessary. Standard one-volt P-P outputs for both audio subcarriers as well as video interface easily to any VTR or use the optional BC-1 modulator for direct TV set hook-up.

For a quality, low cost TVRO system, the Sat-tec R2 receiver can't be beat!



SPECIFICATIONS

Frequency Range:	3.5 - 4.5 GHz
Noise Figure:	12 dB, a 120° K 50 dB LNA and 10' dish provides good quality reception for most of USA.
Audio Subcarriers:	6.2 and 6.8 MHz standard, others available.
LNA Power:	15 volt at 150 Ma LNA Supply built-in.
Power Required:	110 VAC at 15 watts 50/60 Hz, 220 volt available.
Size:	8 x 6 x 3 inches, 3 lbs.
Price:	$995.00, completely wired and aligned; one year warranty.
Optional:	BC-1 RF Modulator Kit, tuneable channels 3-6 with sound....$24.95.

Sat-tec Systems

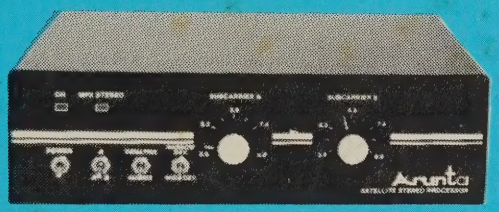
Penfield, NY 14526 • 2575 Baird Rd. • 716-381-7265

Arunta
State-of-the-Art

SKY KING Parabolic Antenna

Commercial Style 2 piece Dish
Desert Tan Finish • 11 ft.&13 ft. Packages
True Polar Single Pedestal Mount
Circular Scalar Feed Horn
Remote Control LNA/Polarity Rotor

SSP-312 SATELLITE STEREO PROCESSOR



Multiplex • Matrix • Discrete
Wide and Narrow Band

**Movie Channel • MTV
Spotlight • CBS Cable • HTN
Seeburg • WFMT**

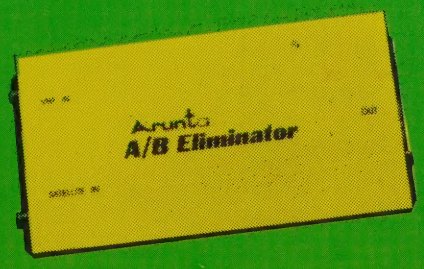
DD 3000 STEREO SATELLITE TELEVISION RECEIVER

The Finest Video Reception Plus
Dual Tunable Audio for Multiplex,
Matrix and Discrete Stereo Plus
Dual Deviation Selection for
Wide and Narrow Band Reception.

Remote Control Dish Movement

- Heavy-duty 50" Travel attaches at dish lip for max. mechanical advantage and stability.
- Positive MAG/PULSE Feedback
- Digital LED Controller assures pinpoint accuracy.

A/B Eliminator



The correct way to combine VHF
and Satellite Television Signals
without Adjacent Channel interference

Arunta
Satellite Television Systems

P.O. Box 15082 • Phoenix, Arizona 85060 • (602) 956-7042

SAT-TEC™ R2B
The leader in low cost TVRO

The R2B, the most highly integrated receiver on the market today!

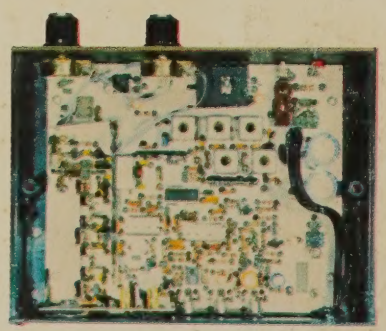
Sat-tec

The name you know FIRST!

- FIRST Low Cost Receiver
- FIRST Volume Production
- FIRST With Off-Shelf Delivery
- FIRST To Ship the Innovative Divide By 2 PLL
- FIRST With Channel Lock AFC

The Sat-tec R2B receiver is our latest full feature receiver, tailored to commercial equipment specifications at a price you can afford. the R2B's single board construction eliminates problematic interconnections and innovative utilization of all components results in a reliable and proven design. Operation is simple—a single tuning knob does it all, and our unique Channel-Lock AFC keeps the tuning sharp and accurate. A new feature is our variable audio tuning to give you complete selection of all subcarriers—without the use of additional plug-ins or devices. This, together with the R2B's full frequency coverage makes it truly compatible with all domestic and international satellites.

For superior value as well as lowest system cost, the choice is but one—the R2B! See your dealer today or write to us direct.



SPECIFICATIONS

Frequency range:	3.6-4.3 GHZ tunable
Audio range:	5.2-7.6 MHZ tunable
Threshold:	8db CNR
IF bandwidth:	30 MHz for full fidelity video
LNA power:	15 volts regulated for up to 2 LNAs
Outputs:	Standard one volt audio and video, compatible with VCRs, monitors and modulators
Optional:	BC-1 RF modulator kit, tunable channels 3-6 with sound

Sat-tec Systems
div. Ramsey Electronics, Inc., 2575 Baird Rd., Penfield, NY 14526, 716-586-3950